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HUET (M.). **La maladie du rond (Polyporus annosus).** [The ring disease (*Polyporus annosus*).]—*Bull. Soc. for. Belg.*, xlviii, 9, pp. 349–371, 1 fig., 1936.

The author discusses an outbreak of ring disease (*Polyporus* [*Fomes*] *annosus*) [*R.A.M.*, x, p. 355; xv, p. 473] on Scots pine [*Pinus sylvestris*], Corsican pine [*P. laricis*], and fir [*Picea excelsa*] in the Héverlé forest, Belgium, where the deciduous trees intermixed remained unaffected.

Initial infection appears to be largely due to the roots being injured by burrowing rodents (especially rabbits) and then infected by spores carried in the fur of the animals. Later spread occurs by contact between healthy and diseased roots. The results of infection vary in intensity according to the site of penetration in the root. If infection occurs on a large root near the collar, the symptoms may become apparent in a few months. In many instances the tree declines for some years and then dies unexpectedly.

In the locality concerned 20- to 30-year-old trees are chiefly affected. The disease has probably existed indefinitely, but has spread with increased rapidity during the past few years. In the worst areas, 100 trees per hect. have to be removed every year, but as the trunk wood is not affected, diseased trees cut down for sale while living suffer no diminution in commercial value. Trees on dry, elevated sites are practically unaffected, the disease becoming progressively worse with decreasing elevation and increasing soil humidity. Infection is most severe where the best soil conditions prevail, and vigour does not retard spread. The worst areas are those previously used for agriculture and treated with chemical fertilizers.

Prevention appears to be impracticable either by trenching or liming. Affected trees should be replaced by deciduous trees, and when pines are to be replanted the soil should be left untouched for 4 or 5 years. Damp sites should be drained, and rodents exterminated.

LAGERBERG (T.). **Några synpunkter på beståndsvård och virkesvård.** [Some aspects of care of standing timber and of wood.]—*Svenska SkogsvFören. Tidskr.*, xxxiv, 2, pp. 396–406, 1936. [English summary on pp. 472–473.]

Spruces in southern Sweden are stated to be liable to severe damage

by *Polyporus* [*Fomes*] *annosus* [see preceding abstract], an essential condition of infection by which is the existence of dead roots [*R.A.M.*, xii, p. 738]; when these portions are in direct communication with the heart of the trunk the fungus rapidly spreads through the latter, the increment of decay reaching up to 1 ft. per annum. The local infection of superficial roots usually occurs through wounds, such as may be inflicted by the carting of felled trees or by the trampling and grazing of cattle, the last-named factor being largely responsible for the attacks of *F. annosus* on aspen [*Populus tremula*]. The mycelium of the fungus is present in the humus layer of the forest and is the chief source of infection of the roots.

Stereum sanguinolentum [ibid., xvi, p. 77] is a common agent of decay following thinning operations and blazing or marking of the trunks.

Forest research in India, 1935–36. Part I. The Forest Research Institute.—91 pp., 1 fig., 1936.

The following items, other than those already noticed, occur in the mycological section of this report (pp. 24–26), dealing with investigations carried out by K. D. Bagchee, A. Hafiz Khan, and R. N. Chatterjee. Species of *Fusarium* have been found to play an important part in the etiology of the shisham [*Dalbergia sissoo*] root disease.

Red-currant (*Ribes rubrum*) leaves were successfully inoculated with cultures of *Peridermium indicum* [*R.A.M.*, viii, p. 77] from Kashmir, the uredo and *Cronartium* stages being reproduced on *Ribes*; *Pinus excelsa* plants inoculated with the *Cronartium* stage from red currant in 1934 are showing symptoms of infection. *Campanula colorata* leaves reacted positively to inoculation with *Peridermium orientale* (*P. complanatum*) [loc. cit.] from *Pinus longifolia* needles by development of the uredo and *Coleosporium* phases. *Peridermium brevius* [loc. cit.] on *Pinus excelsa* needles was found to be genetically connected with a new species of *Coleosporium* on *Senecio rufinervis*. *Peridermium piceae* developed on *Picea morinda* [loc. cit.] needles inoculated with *Chrysomyxa himalensis* from *Rhododendron arboreum*. A new species of *Peridermium* on *Abies pindrow* was successfully transferred to a fern (Polypodiaceae) on which the uredo and teleuto stages were produced.

Positive results were obtained in inoculation tests on *Cedrus deodora* and *Pinus excelsa* with *Fomes annosus* [see preceding abstracts].

Details are given in the wood preservation section (pp. 44–51) of the progress made during the year 1935–6 in the exploitation of the new preparation, ascu [ibid., xiv, p. 337], which was used by the North-western Railway for the treatment of 10,000 softwood sleepers. The total cost of the operations (including a supplementary anti-splitting treatment with a bituminous suspension of petroleum asphalt and crude oil, depreciation, handling, and labour charges) amounted to 7 annas 4 pies [about 8*d.*] per sleeper, whereas the cost of the present creosote–crude oil (40 : 60, 5 lb. per cu. ft.) is just over 1 rupee [1*s.* 6*d.*]. Six Ascu pressure plants came into operation during the year, and at least ten others are expected to start work shortly in various parts of the country.

White (W. L.). **A new species of Chondropodium on Pseudotsuga taxifolia.**—*Mycologia*, xxviii, 5, pp. 433–438, 7 figs., 1936.

A description [with a Latin diagnosis] is given of an apparently hitherto undescribed fungus, commonly found occurring in Oregon and British Columbia on small (1 to 2 by 1 to 1·5 cm.), superficial, slightly sunken, and often somewhat orbicular lesions in the outer cortex of smooth-barked *Pseudotsuga taxifolia* trees, for which the name *Chondropodium pseudotsugae* n.sp. is suggested. It is characterized by erumpent, stalked, columnar, black, minutely scabrous pycnidia, 1 to 1·5 mm. in height, cylindrical above and 125 to 200 μ in thickness, and spreading at the base, which is more or less covered by the thin outer cortical layer of the host, to a diameter of 500 μ; occasionally two or three pycnidia may be found clustered on a common basal stroma. The conidia are hyaline, 4-celled, more or less straight at the basal part when attached to the conidiophores but crescent-shaped or falcate when lying free, and measure 35 to 60 by 3·5 to 4·5 μ. The disease associated with the fungus is stated not to be of a serious nature.

Garbowski (L.). **Przyczynek do znajomości mikroflory grzybnej nasion drzew lesnych.** [Contribution to the knowledge of the fungal microflora of forest tree seeds.]—*Prace Wydz. Chor. Rośl. państw. Inst. Nauk Gosp. wiejsk. Bydgoszczy*, 15, pp. 5–30, 6 pl., 1936. [French summary.]

The mycological analysis of Polish samples of forest tree seeds with germinability below normal revealed the presence of a diversified fungal flora on their surface. *Pyronema omphalodes* was isolated from *Pinus sylvestris* seeds, the predominant tree species in Poland, and was shown experimentally to reduce germination to at least 46 per cent. and occasionally to 5 or even 1 per cent., the average of 13 samples being 20 per cent. An undetermined species of *Botrytis* lowered the germination of the same species to an average of 34 per cent. Other species isolated from *P. sylvestris* seed were: *Chaetomium globosum*, *C. spirale*, *C. tortuosum* n.sp., *Mucor* sp., *Rhizopus arrhizus*, *Oedocephalum glomerulosum*, *Aspergillus flavus*, *A. niger*, *Penicillium crustaceum*, *Trichothecium roseum*, *Stachybotrys lobulata*, *Stysanus medius*, and undetermined species of *Penicillium* and *Fusarium*.

Rohde (T.). **Adelopus-Schütte der Douglasie in Deutschland?** [*Adelopus* needle cast of Douglas Fir in Germany?]—*Forstarchiv*, xii, 18, pp. 305–310, 4 figs., 1936.

The *Adelopus* needle cast of Douglas firs [*Pseudotsuga taxifolia*] reported as occurring in Germany in 1930 [*R.A.M.*, x, p. 634], was actually first detected in Württemberg by Frl. E. v. Gaisberg in 1935. The fungus identified as *Adelopus* [*balsamicola*] on needles previously attacked by *Rhabdocline pseudotsugae* [ibid., xv, p. 832] was not an *Adelopus* but a *Rhizosphaera* [cf. ibid., xi, p. 136], and though only a secondary invader of the needles, is probably responsible for a considerable part of the damage hitherto attributed to *Rhabdocline pseudotsugae*.

Birch (T. T. C.). **Diplodia pinea in New Zealand.**—*Bull. N.Z. For. Serv.* 8, 32 pp., 16 figs., 1936.

In this study, an introduction to which is contributed by A. D. McGavock, the author states that *Diplodia pinea* [*R.A.M.*, xvi, p. 75] is commonly present on dead branches, cones, and felled timber in pine plantations throughout New Zealand, and has also been recorded from Italy, France, Belgium, United States, Argentine, South Africa, and Australia, either as a saprophyte on forest débris or as a weak parasite on pines growing under adverse conditions.

In New Zealand collections of the fungus the pycnidia are borne either singly or in densely bunched, compound groups, and with or without stromata, according to the stage of development and medium of growth. There would thus appear to be no justification for a transference of the organism either to *Botryodiplodia* as *B. pinea* (Desm.) Pet. or *Macrophoma* as *M. pinea* (Desm.) Pet. & Syd., and its inclusion in *Sphaeropsis* as *S. ellisii* [loc. cit.], is also untenable since this genus should comprise only unicellular spore types and those of *D. pinea*, though predominantly non-septate, are often uni- and occasionally biseptate. The name of *D. pinea* (Desm.) Kickx is therefore retained, a list of the synonyms and an English diagnosis being given.

The spores of the fungus are disseminated by means of wind, rain, and insects, while the mycelium is introduced into nurseries on the seed of several species of *Pinus*, including *P. ponderosa* of American origin. In this form *D. pinea* evidently occurs as a saprophyte on the surface of seed coats and in the interior of dead seed. A dark discoloration of *P. radiata* sapwood was found to be due to *D. pinea*, the hyphae of which were concentrated exclusively in the medullary ray parenchyma. No growth was made by the fungus in wood with a moisture content below 22 per cent., based on oven-dry weight.

Although normally a saprophyte, *D. pinea* sometimes assumes a parasitic form on unthrifty trees, on which the symptoms may take the shape of secondary infection on 'stag-headed' trees, 'red top', stem infection, or 'bud wilt' of seedlings. Three-year-old specimens of *P. ponderosa* in the field gave negative results on inoculation with the fungus, whereas trees of the same age and variety, planted in shallow boxes under abnormally humid conditions, showed typical 'red top' symptoms. Only a small proportion of *P. ponderosa* seedlings inoculated with *D. pinea* developed 'bud wilt' under unfavourable conditions of cultivation. The fungus is of economic significance in New Zealand as an agent of sap stain in felled timber, but its importance as a rare facultative parasite on sickly nursery and plantation stock is limited to indicating the existence of adverse silvicultural factors.

Hubert (E. E.). **Permatol : a preservative treatment for exterior millwork.**—*Tech. Bull. West. Pine Ass.* 6, 7 pp., 1 fig., 1936.

The increasing demand during the past few years in the United States for sash, door, and millwork products treated with a chemical preservative has led to the development of three new preservatives, permatol A, B, and C, by the Research Laboratory of the Western Pine Association, Portland, Oregon.

The A formula consists of pentachlorphenol 5 lb., pine oil 1 gall., spreader (either eocene, Standard Oil Co. of California, or any of five others) 1¼ galls., and penetrant (either Thinner No. 1, Union Oil Co., or any of five others) 10¾ galls.; the B of pentachlorphenol 2½ lb., tetrachlorphenol (or orthohydroxydiphenyl) 2½ lb., and ingredients 2, 3, and 4 of the A formula; while the C formula for use against termites consists of tetrachlorphenol 5 lb., and ingredients 2, 3, and 4 of formula A. The new products are stated to have high toxic values and to possess a high degree of permanence besides other desirable features.

There are two methods of application. The first is to dip the unheated wood (finished or semi-finished) in the unheated solution for 10 seconds to 30 minutes. The second is to dip the unheated wood in the preservative at 100° or 110° F. for 10 seconds to 30 minutes. The completely assembled sashes or doors should be dipped in the product, singly or in bundles.

Van Schreven (D. A.). **Beschouwingen over het hartrot van de Biet en resultaten van potproeven in 1935.** [Observations on heart rot of the Beet and results of pot experiments in 1935.]—*Meded. Inst. Suikerbiet., Bergen-o-Z., 1936*, 6, pp. 153–225, 1 fig., 1936. [French summary.]

Following a summary of the literature published of recent years in various countries on the etiology and control of heart rot of beets [*R.A.M.*, xvi, p. 81], the writer fully describes and tabulates the outcome of pot tests in 1935 with Hilleshög beets in water, soil, and glass sand. In the water cultures the maximum development of the plants during a six-week growing period was made in the presence of 0·7 mg. boric acid per l. Beets can tolerate much higher concentrations of boric acid than most agricultural crops [loc. cit.], but the addition of 100 or even 50 mg. of the compound to water cultures induced various anomalies in the foliar habit. In soil cultures (heart rot soil from Switzerland) 50 mg. boric acid per l. effectually prevented the development of the disease. In the glass sand series the effects of an acid fertilizer were compared with those of two inducing an alkaline reaction, two applications of boric acid (each at concentrations up to 100 mg.) being given. In the alkaline series symptoms of heart rot appeared shortly after the second treatment given on 2nd August (all concentrations up to 15 mg.), whereas in acidified soil with comparable boron concentrations this was not the case. The development of the disorder so soon after the second application is thought to denote that the plants require much more boron during the later stages of rapid growth than at the commencement of the vegetative period. It was further shown by these tests that heart rot may affect beets in acid soils with an insufficiency of boron, while those in alkaline soils receiving adequate supplies of this element may escape.

Edgerton (C. W.) & Tims (E. C.). **Diseases of Sugar Beets in Louisiana.** —*Bull. La agric. Exp. Sta.* 273, 12 pp., 5 figs., 1936. [Abs. in *Exp. Sta. Rec.*, lxxv, 4, p. 502, 1936.]

An attempt was made to grow sugar beets on a commercial scale in Louisiana in 1926 and 1927, but production was seriously limited

by the *Rhizoctonia* [*R.A.M.*, xv, p. 486] and *Sclerotium* [? *rolfsii*: ibid., xv, p. 518] rots, the former causing losses up to 50 per cent. of the crop. Both diseases were favoured by moisture, but the former was most severe in cold weather and the latter in warm conditions. Heavy losses may occur in storage as well as in the field. Leaf spot (*Cercospora beticola*) [ibid., xv, p. 550 *et passim*] is liable to cause heavy damage in warm weather, while *Phoma betae* is of minor importance locally.

Asthana (R. P.). **Antagonism in fungi as a measure of control in 'red-leg' disease of Lettuce.**—*Proc. Indian Acad. Sci.*, iv, 3, pp. 201–207, 1936.

Of the fungi tested at the Imperial College of Science and Technology, London, for their repressive effect on the germination, growth in culture, and parasitic vigour (on cut leaves in Petri dishes) of *Botrytis cinerea*, the agent of 'red leg' of lettuce [*R.A.M.*, xv, p. 196], the most active were *Penicillium chrysogenum* [ibid., xiii, pp. 97, 304], *Eidamia* (*Trichoderma*) *viridescens* [ibid., iv, p. 227], *T. lignorum* [ibid., xv, p. 395], and *Phoma* sp., especially the two last-named. A similar effect was produced by filtrates of the nutrient medium (3 per cent. malt agar) in which the fungi had grown, indicating that staling products are involved in the inhibitory process.

Le Cosquino de Bussy (Ivonne J.). **De bacterieziekte van de Boon (Phaseolus vulgaris L.), veroorzaakt door Pseudomonas medicaginis f. sp. phaseolicola Burk.** [The bacterial disease of the Bean (*Phaseolus vulgaris* L.) caused by *Pseudomonas medicaginis* f. sp. *phaseolicola* Burk.]—Thesis, Univ. of Utrecht, 99 pp., 5 pl., 6 figs., 1936. [English summary.]

Pseudomonas [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xvi, p. 85] (which the writer prefers to term 'f. sp. *phaseolicola*' in accordance with current phytopathological usage) is stated to have been responsible since 1923 for severe losses to beans (*Phaseolus vulgaris*) in North Holland [ibid., xi, p. 96], where the disease is known as streak.

A few minor variations were observed between the bacterium isolated from diseased Dutch material and that described by Burkholder [ibid., xi, p. 418], e.g., in the number of cilia, one to three of which were detected by the writer compared with one only by Burkholder, and in the alkaline reaction developed in glucose and saccharose fermentation; these are, however, too slight to warrant any change in the nomenclature of the organism.

Positive results were given by inoculation experiments on two bean varieties, Improved Early Veen and Yellow Citron, by four methods, viz., on seedlings in pots, on seed afterwards sown (*a*) in open ground and (*b*) in tubes, and on soil in pots. In the seedling tests the former variety reacted more intensely to inoculation with strain VI than with strain V of the organism, while in the case of the latter these relations were reversed. In the tests on seed in open ground Yellow Citron suffered most severely, the attacks on Improved Veen and Fine Cluster Princess (included in this series) being milder. Both the first-named varieties were equally affected by the bacterium in the tests with seed

in tubes, the virulence of the symptoms reaching a maximum on a potato agar medium inoculated eight days before sowing, and being at a minimum on Knop's agar inoculated and sown simultaneously. In the soil series infection was most severe when the seed was planted immediately after inoculation.

The seed, which is largely responsible for the dissemination of *Bact. medicaginis* f. sp. *phaseolicola*, contracts infection through the suture of the pod; only the seed coats are involved, but the organism generally penetrates through several layers of the integument and is not confined to the intercellular spaces.

Control measures should include the use of seed derived from healthy plants and subjected to disinfection by ten minutes' immersion in water heated to 50° C., the cultivation of relatively resistant varieties [ibid., xv, p. 697], the removal and destruction of diseased material, spraying with Bordeaux mixture [ibid., xv, p. 419], and crop rotation.

Ayyar (V. R.) & Iyer (R. B.). **A preliminary note on the mode of inheritance of reaction to wilt in Cicer arietinum.**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 438–443, 1 pl., 1936.

From 1931 to 1936, two strains of gram (*Cicer arietinum*) consistently showed marked differences in their reaction to the wilt attributed by Narasimhan to a *Fusarium* [*R.A.M.*, ix, p. 10; xv, p. 423], strain no. 19 showing from 36 to 48 per cent. mortality and strain no. 468 from 0·4 to 7 per cent. When the strains were crossed the mortality distribution in the progeny indicated that incomplete dominance was involved. Progenies of three families each from the higher and lower mortality classes were studied in F_4, and all three of the latter proved homozygous for resistance, while in the former group two were homozygous for high mortality, and the third was intermediate in distribution. The high proportion of homozygous cultures suggests that wilt reaction is governed by only one pair of factors. Sections of the root of the resistant strain 468 showed a thick layer of suberin in the periphery of the cortex, whereas in the susceptible type suberin formation was not marked. The development of the fungus within the host was also very much slower in the resistant than in the susceptible strain. It is concluded that the resistance of strain 468 results from the combined effect of morphological and protoplasmic factors.

Shaw (F. J. F.). **The inheritance of morphological characters and of wilt resistance in Rahar (Cajanus indicus Spreng.).**—*Proc. Indian Acad. Sci.*, iii, 6, pp. 491–492, 1936.

This account of the author's studies on the inheritance of wilt (*Fusarium vasinfectum*) resistance in pigeon pea (*Cajanus indicus*) [*C. cajan*] is an abbreviated version of a paper already noticed from another source [*R.A.M.*, xv, p. 771].

Branas (J.). **Chronique méridionale hebdomadaire. La maladie des yeux.** [Weekly notes from the south. Disease of the buds.]—*Rev. Vitic., Paris*, lxxxv, 2206, pp. 278–281, 1936.

The author explains the frequent failure of the measures recommended for the control of vine excoriosis (*Phoma flaccida*) [*R.A.M.*,

xv, p. 555] by the fact that the mycelium of the causal fungus overwinters in the dormant buds [ibid., xiv, p. 346], thus escaping the action of the chemicals applied. In many cases the mycelium is present not only in the basal buds but also in those placed higher up, thus stultifying the recommendation to remove the former and to preserve the latter. A way out of the difficulty might be to cut the diseased vine stocks down to the ground, so as to promote the formation of suckers, from which a new stock may be developed, provided that all suckers so produced are found to be free from infection. The term 'maladie des yeux' [bud disease] is further suggested as better adapted than excoriosis for characterizing the disease.

TROTTER (A.). **Biologia della Peronospora della Vite e lotta antiperonosporica.** [The biology of Vine mildew and its control.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), v, pp. 65–79, 1 col. pl., 7 figs., 2 graphs, 1936.

After pointing out the need for a spray warning service against vine mildew [*Plasmopara viticola*] in southern Italy the author discusses the different stages of infection by *P. viticola* in relation to phenological factors, the importance of which is emphasized. It is thought that 4 to 6 spray applications should suffice in place of up to 12 now sometimes given. In addition to spraying, it is recommended that leaves bearing oospores should be collected and burnt.

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1935.** [Annual report for 1935 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Annu. agric. Suisse*, xxxvii, 10, pp. 1029–1077, 7 figs., 1 graph, 1936.

The following are among the phytopathological items occurring in this report [cf. *R.A.M.*, xv, p. 135]. The development of downy mildew of the vine [*Plasmopara viticola*] in 1935 was hampered by a cold, dry spell in May and by excessive heat in June and July; applications of Bordeaux mixture, cupromaag [ibid., xv, p. 588], viricuivre, and cupritox gave satisfactory control. Successful inoculation experiments on sound grapes with material of the agent of coître [*Coniothyrium diplodiella*: ibid., xvi, p. 23] dating from 1920, 1925, and 1928 effectively demonstrated the viability of the fungus during a period of 16 years. *Botrytis* [*cinerea*] caused a serious reduction of the grape yield in 1935.

Constantly increasing damage is inflicted, not only on raspberries, but on loganberries [*Rubus loganobaccus*] by *Didymella applanata* [ibid., xi, p. 694], which injures the wood and kills the buds.

BERTUS (L. S.). **Report on the work of the Mycological Division.**—*Adm. Rep. Dir. Agric., Ceylon, 1935*, pp. D53–D60, 1936.

In 1935 an interesting case of tea leaf disease (*Corticium solani*) [*R.A.M.*, viii, p. 470; xiii, p. 216] occurred in Ceylon on four or five 4- to 5-year-old bushes. The leaves were firmly attached to each other by wefts of mycelium; the stems were healthy, and loose mycelium was found on the surface. The fungus probably developed in the soil, ascended the stems, and attacked the leaves.

Sclerotium rolfsii [ibid., xiii, p. 540] was recorded for the first time

on citrus in Ceylon, causing a collar rot of young, imported, grafted orange plants. It was suspected that the fungus had spread from decaying vegetable matter used in the holes or as a mulch.

During a long dry period the bark of the trunk and large branches of grapefruit trees developed a thin longitudinal crack which gradually exposed the wood and sometimes exuded gum. The wound usually healed over in time, but in some cases a species of *Diplodia* penetrated the wood, and killed back the branch. The wounds are attributed to sun scorch following defoliation. Shaving back the affected tissues to the sound wood, painting with a 20 per cent. solution of brunolinum or carbolineum, and tarring gave effective control.

The result of further work on citrus canker (*Pseudomonas citri*) [ibid., xv, p. 136], the worst disease of grapefruit and lime in Ceylon, showed that satisfactory control was given on grapefruit by judicious pruning, the collection and destruction of affected leaves, fruits, and green twigs, and spraying at each new burst of foliage (15 times in all) with 30 oz. colloidal sulphur, 7½ oz. nicotine sulphate, and 30 oz. soft soap in 30 galls. water. Control on severely affected limes has proved difficult, and such trees should be uprooted and destroyed.

Larvae of *Oryctes rhinoceros* were found to have been naturally killed by the green muscardine fungus *Metarrhizium anisopliae* [ibid., xv, p. 137]. Traps infected with the fungus were prepared as in the previous year on an estate situated at an elevation of about 500 ft. above sea-level. All the larvae found in the traps were killed by the fungus, though those in the uninoculated control traps were unaffected. It was necessary to keep the traps fairly moist.

Mildew (*Oidium* sp.) on cowpea vines [*Vigna unguiculata*] was completely controlled by two applications at an interval of six days of 1 oz. colloidal sulphur per gall. of water.

In inoculation experiments on tea roots with pure cultures of *Ustulina zonata* isolated from beech and lime (*Tilia* sp.) in England [ibid., xv, p. 471], and tea and rubber in Ceylon, the tea strain caused the most extensive infection, which involved the roots, collar, and the stem up to a height of about 9 in. The rubber strain infected the tissues for only a distance of 0·7 in., and the lime and beech strains produced practically no infection.

Jak [*Artocarpus integrifolia*] developed a new disease characterized by small, soft, purplish-brown patches on the surface of the fruit from which a species of *Diplodia* was isolated. Inoculations with this fungus on wounded, fully grown fruits caused visible infection in three days and the appearance of the purplish patches a day later. When fully grown fruits attached to the plant were inoculated, infection resulted after ten days. The fungus tended to set up premature ripening, the apparently ripe portions remaining hard.

New records included brown root disease (*Fomes noxius*) of tung oil (*Aleurites montana*), leaf disease (*Cercospora cruenta*) of *Dolichos lablab*, cotton leaf disease (*C. gossypina* and *Macrosporium* sp.), leaf spot (*Macrosporium* sp.) of granadilla (*Passiflora quadrangularis*) [cf. ibid., xv, p. 593], collar disease (*S. rolfsii*) of young mahogany (*Swietenia mahagoni*), and downy mildew (*Pseudoperonospora cubensis*) of snake gourd (*Trichosanthes anguina*).

NARASIMHAN (M. J.). **Report of work done in the Mycological Section for the year 1934–1935.**—*Adm. Rep. agric. Dep. Mysore, 1934–1935*, pp. 19–22, 1936.

The first external symptom of a widespread disease of Ras Bale plantains due to *Sclerotium rolfsii* [cf. *R.A.M.*, xiii, p. 540] in Mysore and Tumkur is a splitting of the pseudo-stem near ground-level and a reddish discoloration of the sheaths. Infection progresses inwards through successive layers of leaf sheaths and finally involves the pseudo-stem. Over 2,000 plants have been satisfactorily treated by removing affected sheaths and applying Bordeaux paste to the base or swabbing the pseudo-stem with 0·5 per cent. Bordeaux mixture.

A small plot of rice showing infection by *Piricularia* [*oryzae*: ibid., xvi, p. 122] was dusted with flowers of sulphur, which largely controlled the fungus.

The so-called 'katte' disease of cardamons [*Elettaria cardamomum*], which seriously attacked nearly 60 per cent. of nursery seedlings in the Saklespur area, originates in the form of minute, white spots on the leaves, surrounded by a water-soaked halo and bearing a few pycnidia of a *Coniothyrium*. At a later stage the entire leaf surface becomes spotted and eventually the apical leaves curl up and decay. The same host is liable to extensive infection by a *Corticium*.

The teleutospore stage of the coffee leaf disease [*Hemileia vastatrix*: ibid., xv, p. 798] was found to be prevalent in Bangalore, except during the period of heavy rains from June to September.

Apple plants inoculated with a pure culture of *Schizophyllum* [*commune*: ibid., xiii, p. 641; xvi, p. 106] from diseased trees failed to develop infection, indicating that other fungi may be responsible for wood rot though obscured by the rapidly growing *S. commune*.

Very good control of orange mildew [*Oidium tingitaninum*: ibid., xv, p. 136] was obtained in the Saklespur area with gingelly oil Bordeaux.

SU (M. T.). **Report of the Mycologist, Burma, Mandalay, for the year ending the 31st March 1936.**—5 pp., 1936.

The following are among the items of interest in this report [cf. *R.A.M.*, xv, p. 280]. A species of *Helminthosporium* closely resembling *H. oryzae* [*Ophiobolus miyabeanus*] was observed on *Panicum colonum* grass surrounding rice plots infected by the brown spot disease [ibid., xv, p. 632].

Chilli (*Capsicum annuum*) mosaic [ibid., xiv, pp. 78, 344] occurred in a fairly severe form in the northern part of Yamèthin District.

None of the isolations made before storage from 400 mangosteen (*Garcinia mangostana*) stalks yielded *Diplodia* [*natalensis*] [loc. cit.], which probably gains ingress, therefore, through some other channel.

The incidence of storage rots in Mandalay oranges due to *Penicillium digitatum*, *P. italicum*, *D. natalensis* [ibid., xv, pp. 715, 716, 797], and *Phoma* sp. amounted to 56, 7, 7, and 28 per cent., respectively.

The cultivation of the edible straw mushroom (*Volvaria diplasia*) [ibid., xiv, p. 286] was hampered by the development of a disease in the beds due to *Corticium* sp., which in some cases entirely precluded production.

Simmonds (J. H.). **The work of the Plant Pathological Branch.** — Reprinted from *Rep. Dep. Agric. Qd, 1935–1936*, 3 pp., 1936.

This report contains, *inter alia*, the following items of phytopathological interest. Good commercial control of barley covered smut [*Ustilago hordei*: *R.A.M.*, xiv, p. 572] was given by the mercurial dusts sanogran A, ceresan U.T. 1875, and Cooper's mercurial; formalin (1 in 320) was less effective, and sulphur was useless. The same mercurial dusts and the formalin treatment gave good control of prairie grass [*Bromus unioloides*] smut [*U. bromivora*: loc. cit.].

Seed treatment with ceresan reduced the amount of seed-borne infection by cotton angular leaf spot [*Bacterium malvaccarum*: see below, p. 171] to negligible proportions.

Further investigations into banana black end, chiefly due to *Gloeosporium musarum* [ibid., xv, p. 281], indicated that latent infection may occur. The presence of dead leaves round the pseudo-stem appeared to conduce to the disease, while frequent trashing reduced its incidence. Field studies demonstrated that severe fruit infection may arise in the absence of many free spores in the plantation or packing-shed, rain, apparently, being the chief agent of spread. The main source of spore inoculum is the pustules on dead petioles.

Appreciable losses have recently been caused by a banana trouble known locally as 'rubbery fruit', in which the skin ripens to an almost brownish-yellow and often shows conspicuous water-soaked lines running longitudinally. The flesh is abnormally firm and rubbery, the fruit bending considerably under pressure without breaking. The condition is tentatively attributed to physiological disturbances associated with plantation conditions interfering with ripening.

Sclerotinia sclerotiorum and *Monilochaetes infuscans* [ibid., xiv, p. 87] were recorded from beans and sweet potatoes, respectively. Papaw yellow crinkle [ibid., xiv, p. 216] was of considerable economic importance in the Yarwim district.

In addition to *Boletus granulatus* [ibid., xii, p. 778], *Rhizopogon luteolus* was found to form mycorrhiza on several species of *Pinus*. Acidifying the soil with 4,200 lb. sulphur per acre led to rapid mycorrhiza infection in exotic pines in the district concerned, the treatment enabling pine seedlings to be grown locally, though previously it had been necessary to obtain them from coastal nurseries.

The organism responsible for root rot of hoop pine [*Araucaria cunninghamii*: ibid., xv, p. 281] was identified at the Imperial Mycological Institute as a strain of the *Rhizoctonia crocorum* group [*Helicobasidium* sp.]. It appeared to be controlled by means of Cheshunt mixture.

A butt rot of maple [*Acer*], *Flindersia brayleyana*, kauri pine [*Agathis australis*], hoop pine, and *Cupressus lusitanica*, which caused appreciable loss, was associated with a fungus provisionally identified as *Hymenochaete mougeotii*.

Martyn (E. B.). **Report on the Botanical and Mycological Division for the year 1935.**—*Div. Rep. Dep. Agric. Brit. Guiana, 1935*, pp. 89–92, 1936.

The following are among the items of interest in this report [cf. *R.A.M.*, xv, p. 202]. Blue Stick rice raised from seed procured from

the seed-farm of the Department of Agriculture, Henrietta, Essequibo, was attacked by *Sclerotium oryzae* [*Leptosphaeria salvinii*: ibid., xvi, p. 123] in three localities of the Northern Essequibo Islands; no other variety was affected, nor was infection reported from the seed station itself. Previous outbreaks of *S. oryzae* in the Colony caused only negligible damage. As in 1932, *Acrothecium lunatum* [*Curvularia lunata*: ibid., xv, p. 740] was found to be associated with a brown discoloration of the palese of flowering heads of rice, especially Demerara Creole [ibid., xiii, p. 357] and No. 79, during the wet season. Inoculation experiments with the fungus in a damp atmosphere gave positive results.

Sporadic outbreaks of banana leaf spot (*Cercospora musae*) [ibid., xv, p. 705] were observed on the Gros Michel variety on the east and west banks of the Demerara and on the east bank of the Berbice River. The same variety was mildly infected by *Helminthosporium torulosum* [ibid., xv, p. 451] on the east bank of the Berbice River.

Cacao in a small area in the North-West District was attacked by *Corticium salmonicolor* [ibid., xiv, p. 87 *et passim*].

Forty-eighth Annual Report of the Arkansas Agricultural Experiment Station for the fiscal year ending June 30, 1936.—*Bull. Ark. agric. Exp. Sta.* 337, 73 pp., 4 figs., 1936.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiv, p. 221]. Of the 29 cotton varieties and strains tested at the Cotton Branch Station during the period under review by V. H. Young and L. M. Humphrey, Half and Half was the most susceptible to wilt (*Fusarium vasinfectum*) [ibid., xv, p. 149], with 50 per cent. infection, followed by Acala 120-25 (33), while a fair degree of resistance was shown by Dixie 14–5 and 14-1, Lightning Express 8, Dixie Triumph 25, Rhyne's Cook and Clevewilt, and Rowden 4046 and 5056. Half and Half was also the most susceptible variety at Ozark in western Arkansas, where Super Cleveland was severely attacked. Both wilt and 'rust' or potash hunger [loc. cit.] have been observed in the course of eight years' experiments to be more severe in plots manured with phosphate, either alone or in combination with sodium nitrate, than in untreated ones, while the application of kainit leads to a striking reduction in the disease incidence, the following percentages of wilt being counted: controls 16·48, 6–8–12 fertilizer (600 lb.) 4·25, 6–8–0 24, phosphate alone 36, and kainit 1·64. Stable manure, while inferior to a mixed fertilizer or to muriate of potash or kainit alone in combating wilt, is nevertheless valuable for this purpose.

Short-grain, early maturing varieties of rice were found by E. M. Cralley to be generally more resistant to stem rot [*Helminthosporium sigmoideum* var. *irregulare*: ibid., xv, p. 314] than those with medium or long grains, and attempts are in progress to develop these characters by hybridization. An investigation of irrigation practices in relation to the virulence of stem rot showed that the withdrawal of standing water from the fields for certain periods prior to the maturity of the crop retards the development of the disease but does not normally increase the yields. The viability of the sclerotia of the fungus in the soil was found to persist for fully two years, so that short-period rota-

tion schemes are not likely to be effective against stem rot, the rapid advance of which was found to be promoted by a uniform water temperature of 75° to 85° F. in August and September.

In H. R. Rosen's studies the fireblight pathogen, *Erwinia amylovora* [*Bacillus amylovorus*] and the agent of pear blast (*Phytomonas* [*Pseudomonas*] *syringae*) [ibid., xv, p. 23] have sometimes been found in abundance in pear and apple blossoms that have failed to set. Pear nectar has been shown to form an excellent medium for the growth of *B. amylovorus* [ibid., xiv, p. 370], strands of which have been traced as far as eight cell layers below or to the sides of the sub-nectarthodal chambers within 48 hours from inoculation. The invasion of the tissues involves not only passage through the intercellular spaces [ibid., vii, p. 142; viii, p. 250] but localized dissolution of the middle lamellae and delicate cell-walls. Apple blossoms are frequently penetrated through the stigmas, the process being apparently favoured by the absence of a cuticle on the papillae and the presence between the latter of numerous air spaces. Within 52 hours after inoculation through these channels, bacterial strands have been traced through the entire length of the style and into the upper part of the receptacle. When the bacteria gain ingress through the anther locules they invade the filaments by way of the connective and ultimately reach the receptacle.

One of the worst epidemics of black spot of roses [*Diplocarpon rosae*: ibid., xv, p. 781] on record occurred in the State in 1935; the best control (though not altogether adequate) was given in H. R. Rosen's experiments by a dusting mixture of sulphur, lead arsenate, and colloidal clay. The McGredy, Ami Quinard, and Lady Alice Stanley varieties are resistant.

Report of the Michigan Agricultural Experiment Station for the two years ended June 30, 1936.—61 pp., 1936.

The following are among the items of phytopathological interest in this report [cf. *R.A.M.*, xiv, p. 219]. The total amounts of carbohydrates in the leaves of healthy and mosaic red raspberries [see below, p. 194] are about equal, but the proportions are different, the diseased foliage containing about half as much glucose and three times as much sucrose as the healthy and considerably less starch, which occurs mostly in the form of amylopectin in the former and in that of amylodextrin in the latter.

Both wild and cultivated plums have been found to harbour certain viruses affecting peaches [viz., yellows and little peach] without sustaining any apparent damage [ibid., xiv, p. 682], thereby serving as reservoirs of infection which is transmissible to the alternate host in a virulent form.

Satisfactory commercial control of apple scab [*Venturia inaequalis*], even in epidemic form, may be obtained by thorough and timely applications of 'electric' and flotation sulphur [ibid., xv, p. 727] at the rate of 6 lb. per 100 galls. of spray, but for average conditions the use of the standard lime-sulphur for the pre-blossom applications is probably safer.

From 90 to 95 per cent. resistance to wilt (*Fusarium*) [*bulbigenum* var. *lycopersici*: ibid., xvi, p. 132] has been shown by the newly released

Michigan State Forcing tomato, the F 7 progeny of a cross between Ailsa Craig and Marglobe. This variety constituted some 60 per cent. of the 1936 commercial forcing crop in the Grand Rapids area.

A new strain of Michigan Golden has been found to equal any of the commercial strains of yellow celery, which it far outyields, moreover, when planted on soil infested by *Fusarium* yellows [ibid., xiv, p. 737].

Laboratory studies have revealed striking differences in the texture of the sclerotial tissues of *Rhizoctonia* [*Corticium*] *solani*, which are believed to account for the variable results obtained in the fungicidal treatment of black scurf [ibid., xv, p. 602 *et passim*]; acidulated mercuric chloride is the best of the compounds hitherto tested against this disease.

Semesan jr. [ibid., xiii, p. 503] gave good control of seedling blight of field maize [*Gibberella saubinetii*] in 1936, while wheat bunt [*Tilletia foetens*] was effectively combated by copper carbonate, new improved ceresan [ibid., xv, pp. 10, 346, and below, p. 162], and monohydrated copper sulphate.

Work of the Agricultural Experiment Station. Report of the Director for the year ending June 30, 1935.—*Bull. Mo. agric. Exp. Sta.* 370, 100 pp., 1 fig., 1936.

Numerous items of phytopathological interest are included in the sections of this report dealing with botany, horticulture, and field crops [cf. *R.A.M.*, xv, p. 281]. C. M. Tucker estimates that the oat crop was reduced by 20 to 25 per cent. as a result of smut [*Ustilago avenae* and *U. kolleri*] infection during the period under review, the corresponding figures for loose (*U. nigra* [see below, p. 167] and *U. nuda*) and covered [*U. hordei*] smuts of barley being 5 and 20 per cent., respectively. *U. nuda* in the Spartan and Glabron spring varieties was more effectively combated by lengthy immersion in water at 45° to 48° C. than by shorter periods (an hour or less) at 50° to 55°, the addition to the water of traces of [American] ceresan largely preventing the injury to germination liable to accompany this method of control, especially in Glabron, though not otherwise increasing the efficacy of the treatment. In the case of the winter variety, Tennessee No. 5, however, ceresan and formaldehyde, as well as protracted immersion in hot water, gave good control, a fact interpreted as pointing to the implication of *U. nigra* rather than *U. nuda* in the causation of loose smut in the winter stands, this being the first record of the former in the State.

C. M. Tucker, C. G. Schmitt, and G. W. Bohn noted the following varietal reactions (in decreasing order of resistance) to *Fusarium* [*bulbigenum* var.] *lycopersici* among tomato varieties [see preceding abstract]: Marglobe, Break o' Day, Pritchard, Globe, Stone, Norton, and Earliana. Tubes of agar inoculated with the fungus and placed just below the soil at a temperature of 27·5° to 58° showed no growth after a certain length of time, but resumed development when incubated; those buried at depths of 4, 8, and 12 in. (29° to 30°) showed progressively more luxuriant growth.

Among the species of *Phytophthora* received by C. M. Tucker during the year were *P. parastica nicotianae* from tobacco in Poland, *P. parasitica* from *Antirrhinum majus*, *Dianthus caryophyllus*, and papaw

in Mauritius, and from *Robinia pseud-acacia* in Virginia, *P. capsici* from *Cucurbita pepo* and *Capsicum annuum* in Virginia, *P. cinnamomi* from *Pinus resinosa*, *P. sylvestris*, and *Quercus rubra* in Maryland and from *Picea abies* in Virginia [ibid., xvi, p. 72], and *P. megasperma* [ibid., xv, p. 188] from *Matthiola incana* and *Brassica* spp. in California.

A white bacterium, somewhat resembling *Bacterium* [*Pseudomonas*] *cerasi* [ibid., xiv, p. 16] var. *prunicola*, was isolated by C. M. Tucker from leaf spots and cankers on cherries and inoculated into the Schmidt's Big, Bing, and Black Tartarian varieties and also into peaches with positive results. The Yellow Glass cherry variety appears to be resistant. The lesions induced by the organism are circular, with a light brown centre and a narrow reddish halo, and the cankers are formed near the tip of the green stems.

The incubation of [tobacco mosaic] virus fractions with trypsin [ibid., xi, p. 334] by C. G. Vinson led to a marked decrease of infectivity, which was largely restored by 20 minutes' heating at 70°. Papain (alone, but not in combination with trypsin) inactivated the virus to such an extent that heating at 70° failed to restore its original virulence. Gradual inactivation (incomplete after 5½ months) was also brought about by mixed cultures of micro-organisms.

A method has been devised for reducing the ash content of virus preparations to 2 per cent. of the total solids, compared with 30 and 10 to 20 per cent. for the acetone and safranin-virus precipitates, respectively [ibid., xv, p. 687].

The best yellows- [*F. conglutinans*: ibid., xv, p. 3] resistant cabbage varieties for Missouri are Marion Market, Jersey Queen, Globe, and a new (Wisconsin) strain of Copenhagen, all of which in H. G. Swartwout's and R. A. Schroeder's tests showed 98 to 100 per cent. resistance on a heavily infested soil inducing 67 to 89 per cent. susceptibility in the standard types.

The National Agricultural Research Bureau of the Ministry of Industry National Government of the Republic of China. Report for the year 1935.—*Misc. Publ. nat. agric. Res. Bur. Minist. Ind., China*, 5, 68 pp., 1 fig., 1936.

The following items of phytopathological interest occur on pp. 34–36 of this report. Loose and covered smut of barley (*Ustilago nuda* and *U. hordei*), covered smut of oats (*U. levis*) [*U. kolleri*], and loose and flag smuts of wheat (*U. tritici* and *Urocystis tritici*) are stated to be co-extensive with the cultivation of the respective crops in China, whereas the loose smuts of oats and rye (*Ustilago avenae* and *U. tritici* [*R.A.M.*, iv, p. 445; v, p. 226]) are comparatively rare. Both types of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] proved amenable to control by two minutes' immersion of the seed-grain in water heated to 52° C. [ibid., xiv, p. 745]. The simplest and cheapest method of combating the wheat smuts is by two to four hours' immersion at 45° to 48°, which reduces infection 99 per cent. and increases the yield by some 30 per cent. *U. crameri*, the agent of the destructive kernel smut of millet [*Setaria italica*: ibid., xiv, p. 691], was well controlled by four to six minutes' immersion of the seed-grain in water at 58°, resulting in an increased yield of some 39 per cent., while formalin, ceresan, and

alcohol were also effective for this purpose, augmenting the output by over 32 per cent.

Sclerotinia sclerotiorum [ibid., xv, p. 781; xvi, p. 13] has been isolated from 15 vegetable and other hosts. No morphological or physiological differences could be detected between this species and the forms parasitizing Chinese vetch (*Astragalus sinicus*) and groundnuts, which are usually known, respectively, as *S. trifoliorum* [ibid., xv, p. 725] and *S. miyabeana* [ibid., xiii, p. 616]. The host range of *S. minor* [ibid., xv, p. 24] appears to be less extensive than that of *S. sclerotiorum*, comprising in these studies only groundnut, *A. sinicus*, broad beans [*Vicia faba*], and the weed *Erigeron acris*. An undetermined species of *Sclerotinia* was found parasitizing broad beans only.

Van der Goot (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1935.** [Diseases and pests of cultivated crops in the Dutch East Indies in 1935.]—*Meded. Inst. PlZiekt., Batavia*, 87, vii+106 pp., 1936.

This report, prepared on the usual lines [cf. *R.A.M.*, xv, p. 345] contains, among many others, the following records of interest. *Xylaria thwaitesii* [ibid., xiv, p. 743] was found on the dead roots of young teak [*Tectona grandis*] in Java plantations, where the same host also suffered from a basal rot due to *Fomes noxius* [ibid., xv, p. 345] and severe infection by slime disease [*Bacterium solanacearum*: ibid., xiv, p. 153].)

F. noxius appears to be the cause of heavy damage to cacao plantings on the north coast of Java [ibid., xii, p. 425].

According to a report from the Central and East Java Experiment Station, *Crotalaria* is attacked by *Parodiella spegazzinii* [ibid., vii, p. 679].

Hevea rubber in West Java was extensively infected by *Septobasidium rubiginosum* [ibid., x, p. 557]. In the central and eastern districts *Polyporus* [*F.*] *lignosus* is the most important root fungus of rubber [ibid., xv, p. 136]. Mildew (*Oidium heveae*) was relatively innocuous during the period under review. A rubber planting in the Besoeki district was visited by an epidemic of *Helicobasidium compactum* [ibid., xiv, p. 426].

Heavy losses in Java *Cinchona* plantations were caused by *Rosellinia arcuata*, *Armillaria mellea* [ibid., x, p. 298], and other root fungi, while *Moniliopsis aderholdi* was present in the seed-beds [ibid., vii, p. 308].

Five coffee plantations under the supervision of the Central and East Java Experiment Station are now infected by the *Rhizoctonia* causing top die-back, while a species of the same genus was responsible for damping-off on two [ibid., xv, p. 345]. The former disease was observed during 1935 for the first time in the Besoeki district.

Oil palms in Java were attacked by *F. noxius* [ibid., xv., p. 78] and red rust (*Cephaleuros* sp.).

Extensive damage was inflicted on the Java sugar-cane crop by pokkah-boeng, attributed to *Fusarium moniliforme* [*Gibberella moniliformis*: ibid., xv, p. 346] and other *F.* spp., up to 30 per cent. infection by which was reported from East Cheribon. By means of stringent selection of planting material and disinfection of knives the incidence of gumming disease (*Bact. albilineans*) [ibid., xvi, p. 126], which was very prevalent in 1935, may be considerably reduced.

A marked increase in the *Vanilla* [*planifolia*] disease due to *Phytophthora* [cf. ibid., ix, p. 767; xiii, pp. 58, 618] was reported from the Semarang district of Java as a result of intensive cultivation.

Berthelot (A.) & Amoureux (Germaine). **Sur les tumeurs obtenues par inoculation de Bacterium tumefaciens à des plantules et des jeunes plantes cultivées aseptiquement.** [On the tumours obtained by the inoculation of *Bacterium tumefaciens* into seedlings and young plants cultivated aseptically.]—*C.R. Acad. Sci., Paris*, cciii, 14, pp. 629–631, 1936.

Seedlings of pea, vegetable marrow, and Large Russian one flowered sunflowers (*Helianthus uniflorus*) [*Helianthella uniflora* Torr. & Gray] were raised in glass tubes on synthetic agar under strictly aseptic conditions and inoculated with *Bacterium tumefaciens* [cf. *R.A.M.*, xv, p. 206] by means of a fine glass needle either immediately after germination or at a height of 5 to 10 cm. The conditions of the tests were peculiarly favourable to the organism, which developed on the inoculated plants with much greater luxuriance than in the case of older plants in pots or in the ground, the formation of neoplasms frequently commencing as early as a week after inoculation. The advantages and potentialities of this experimental technique are briefly indicated.

Haskell (R. J.). **The present status of seed treatment discussed at American Seed Trade Association Convention.**—*Agric. News Lett.*, iv, 10, pp. 135–139, 1936. [Mimeographed.]

A stimulus was given to the large-scale treatment of seed-grain by the great drought of 1934, when the Government of the United States bought several million bushels of wheat, oats, and barley for seed purposes. The value of the practice was further emphasized by the black rust [*Puccinia graminis*] epidemic of 1935 [*R.A.M.*, xvi, p. 25], which was shown primarily to affect crops raised from mouldy seed of poor quality and low vitality. At the Minnesota and Washington, D.C., Agricultural Experiment Stations the average increases in the emergence of seed-grain treated with organic mercury dust were 14, and 12 and 9 per cent. (two tests), respectively; similar figures were obtained in North Dakota and Canada. Centralized or community seed-treatment is stated to be gaining ground [ibid., xvi, p. 144]. Portable cereal seed-treating outfits, mounted on trucks and usually combined with cleaning equipment, originated in the West, and several large seed companies in the East have now also adopted co-operative methods, a Virginia firm, for instance, having disinfected some 100,000 bushels of wheat, oats, and barley in 1935.

Leukel (R. W.). **The present status of seed treatment, with special reference to cereals.**—*Bot. Rev.*, ii, 10, pp. 498–527, 1936.

After pointing out that losses due to bacterial and fungal diseases of commercial crops in the United States amount to about $1,000,000,000 annually, the author reviews the development of seed disinfection treatment and associated problems as they apply to conditions in the United States under the following headings: historical, advantages of dust fungicides, problems in developing and testing seed treatments, cereal

diseases combated by seed treatment, fungicidal materials, organic mercurials, control of diseases of vegetables, ornamentals, and other crops, centralized seed treatment [see preceding abstract], and effects of seed treatment. A bibliography of 139 titles is appended.

PORTER (R. H.) & LAYTON (D. V.). **Small grain diseases in Iowa and their control.**—*Ext. Circ. Ia St. Coll.* 226, 23 pp., 19 figs., 1936.

Short, popular notes are given on the symptoms and control by seed treatment of seed-borne diseases of barley, oats, wheat, and rye. On the basis of extended tests over a period of three years the authors recommend the use of new improved ceresan against a number of these diseases [see above, p. 158]. Several makes of large seed-treatment machines are now available for use in grain elevators.

BRENNER. **Saatreinigung und Aufbereitung.** [Seed-cleaning and preparation.]—*Tech. in d. Landw.*, xvii, 8, pp. 163–165, 1 fig., 4 diags., 1936.

Among the seed-treating machines on view at a recent exhibition at Frankfurt-am-Main was the short disinfection apparatus Primator (Drescher, Halle) to which the silver medal of the Reich Food Board has been awarded, and a new outfit for the same purpose constructed by Röber, Wutha (bronze medal). In this connexion some advantages of the short disinfection process [*R.A.M.*, viii, p. 768 *et passim*] over dusting are briefly indicated, viz., suitability of the former for oats and in general on very dry soils, and avoidance of the risk of inhalation of dust by operators.

GASSNER (G.) & GOEZE (G.). **Einige Versuche über die physiologische Leistungsfähigkeit rostinfizierter Getreideblätter.** [Some experiments on the physiological efficiency of rust-infected cereal leaves.] —*Phytopath. Z.*, ix, 4, pp. 371–386, 13 graphs, 1936.

The inoculation of wheat leaves with a physiologic form of *Puccinia glumarum* [*R.A.M.*, xv, p. 144] producing the 'immune' type of infection on a given variety exerted no influence on the assimilatory capacity, chlorophyll content, and transpiration volume of the foliage. On the other hand, the use of forms causing recognizable symptoms was followed, about a week after inoculation, by a definite decline both in resistant and susceptible varieties, in the chlorophyll content and assimilatory capacity of the leaves. In the case of a virulent type of infection the transpiration relations of the inoculated leaves differ widely from those of the controls; whereas in the latter the transpiration and assimilation curves run approximately parallel, in the former the transpiration values rise while those for assimilation fall sharply, doubtless on account of the combined transpiration of the leaf and of the fungus during the period of sporulation. Evidently, therefore, the disorganization of the water balance is one of the factors to be considered in the appraisal of yield reductions from cereal rusts.

NOZDRATCHEFF (K. G.). Поваренная соль в борьбе с ржавчиной зерновых культур. [Common salt in the control of cereal rusts.]—*Pl. Prot. Leningr., 1936*, 10, pp. 28–31, 1936. [English summary.]

The author states that in hanging drop cultures the uredospores of

wheat brown rust [*Puccinia triticina*] failed entirely to germinate in a 5 per cent. sodium chloride solution, while the germination was reduced from 51·4 per cent. in the control to 1·3 per cent. in a 1 per cent. solution. Field tests in 1933 and 1935 showed that in plots that had been top dressed with salt (150 kg. per hect.) after the disappearance of the snow cover, the incidence of brown rust was reduced from 34·6 and 22·2 per cent. in the controls, to 10·1 and 10·5 per cent., respectively. Further researches on the use of salt in the control of cereal rusts are advocated.

Rashevskaya (Mme V. F.) & Barmenkoff (A. S.). Выявление физиологических рас **Puccinia triticina Erikss.** в Союзе в **1935** г. [Determination of the physiological races of *Puccinia triticina* Erikss. in the U.S.S.R. in 1935.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 5–20, 3 figs., 1936. [English summary.]

This is a somewhat expanded and fully tabulated version of the authors' report on the biological composition of wheat brown rust (*Puccinia triticina*) in the U.S.S.R., an account of which has already been noticed from another source [*R.A.M.*, xvi, p. 25]. Of the 13 physiologic forms recorded, forms 64 to 69, inclusive, are stated not to have been previously described in literature. Form 64 gave type 4 reaction on the Malakoff, Carina, Brevit, Webster, and Loros, and type *x* reaction on the Mediterranean, Hussar, and Democrat differential varieties; form 65 gave type 4 reaction on Malakoff, Webster, Loros, and Hussar, type 2 on Carina and Brevit, and 0-1 type on Mediterranean and Democrat; form 66 gave type 4 reaction on all the varieties; form 67 gave type 4 reaction on Malakoff, Webster, Loros, Hussar, and Democrat, type 2 on Carina and Brevit, and type 0 on Mediterranean; form 68 gave type 2–3 on all the varieties, except on Webster, on which the reaction was of type 1–2, and on Malakoff which was immune from it; and form 69 gave type 2–3 reaction on all of the varieties. [These new forms are distinct from forms 66 to 69 described by Florence M. Roberts [ibid., xv, p. 707], who states in a footnote that she used international numbers assigned by C. O. Johnston in January, 1935; and from forms with similar numbers described by Sibilia: ibid., xvi, p. 89.]

Goeschele (E. E.). Биологический состав бурой ржавчины **Puccinia triticina Erikss.** в Одесском районе. [The biological composition of the brown rust *Puccinia triticina* Erikss. in the Odessa region.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 21–27, 1936. [English summary.]

As a result of his researches since 1931, the author established the presence in the wheat-growing areas around Odessa of the physiologic forms 13, 20, 21, and 24 of brown wheat rust (*Puccinia triticina*) [see preceding abstract], and also of a fifth form close to form 31, but differing from it in its reaction on the differential variety Carina. An experimental study of form 13 showed that at temperatures lower than normal it reacted like form 14 on the Mediterranean and Democrat varieties. From a review of the relevant literature and from his own results the author considers that the present internationally agreed range of eight differential wheat varieties (which he terms 'analysers') should be somewhat extended and should also comprise wheats other than soft

ones. In his opinion, all the biotypes of *P. triticina* which react similarly on a determined set of analysers should be grouped together under the term 'iso-reagents', and then these groups may be analytically distributed into biological or physiological races with due regard to the ecological adaptation and geographical distribution of both rust biotypes and host varieties, and to the genetical constitution of the latter as determined by hybridization studies [*R.A.M.*, ix, p. 768].

Fomin (E.). Использование сортовых свойств растений в борьбе с болезнями. [Utilization of the varietal characters of plants in disease control.]—*Bull. Ukrain. sci. Rec. Inst. Grain Culture, Phytopath. Lab., Kharkoff*, 1, pp. 88–133, 4 figs., 1935. [English summary. Received January, 1937.]

A tabulated account is given of investigations on the breeding of cereals against disease carried on since 1925 at different agricultural centres of the Ukraine. Among other things, it was experimentally shown that resistance in wheat to bunt (*Tilletia caries*) was very significantly affected by the depth at which the seed was sown, e.g., infection in soft wheats raised from artificially bunt-contaminated seed varied from 1·8 to 34·5 per cent. when sown 1 cm. deep, from 19·3 to 70 per cent. at 4 cm., and from 62 to 91·7 per cent. at 7 cm., the corresponding figures for hard wheats being 2·3 to 17·6, 4·7 to 53·6, and 22·8 to 86·9 per cent., respectively. Among the large number of spring wheat varieties tested very few exhibited practical resistance to bunt, the least attacked being found in the botanical varieties *milturum*, *lutescens*, and *albidum* of the soft, and in the varieties *hordeiforme* and *coerulescens* of the hard wheats. The relatively higher resistance of the hard wheats is in part attributed to the fact that in the germination process the plumule of the embryo in the great majority of cases develops for the first few days inside the seed coat, being thus protected from invasion by the fungus, and emerges in a more advanced, and therefore less susceptible, stage of growth than the plumule of the soft wheats, which appears very soon after germination. Winter wheats, as a class, are appreciably less susceptible to bunt than spring wheats, the least amount of infection having been observed in the *milturum* and *alborubrum* botanical varieties.

Soft wheats, both autumn- and spring-sown, were all shown to be susceptible to loose smut (*Ustilago tritici*) in artificial infection tests, and only a few varieties showed practical resistance in the field; hard wheats, on the other hand, are generally more resistant, and a considerable number of varieties were found showing practical resistance under natural conditions. Most of the oat varieties tried were highly susceptible to both covered and loose smuts (*Ustilago levis* [*U. kolleri*] and *U. avenae*), only a few exhibiting resistance, those belonging to the botanical variety *aurea* being the least attacked.

While soft spring wheats are, as a rule, severely attacked by brown leaf rust (*Puccinia triticina*), hard wheats are much more resistant, the reverse relationship obtaining for stem [black] rust (*P. graminis*); only one of the varieties of the former which were tested, namely, 0274 of the Odessa station, showed practical resistance to brown rust in some years, and another, namely, 062 of the same station, to black rust.

Among winter wheats, the variety 2537/64 Zaria [Dawn] was practically resistant to brown rust throughout the Ukraine, and the varieties 074, 62/24, 30–11, 22–6, and 13–040 also appeared to be resistant to this rust. Almost all the resistant varieties belong to the botanical variety *erythrospermum*, which therefore deserves special attention from the wheat breeders. Only one oat variety, Verkhniatcheski 053, showed high resistance to crown rust (*Puccinia coronifera*) [*P. lolii*]. Field observations showed that in 1933 all the winter and spring wheats were severely attacked by *Septoria tritici* [*R.A.M.*, xvi, p. 20], infection being 80 to 100 per cent. in the former and 30 to 70 per cent. in the latter. A relative degree of resistance was only shown by the winter wheat variety 2537/64 Zaria. The highest degree of resistance to *Helminthosporium gramineum* was exhibited by the barley varieties Wiener, 10/30, 041, 322, 23/11, 176/10, 307, 25/32, and Grushevski. Black point (*H.* sp.) [ibid., xiii, p. 759; xv, p. 433] in wet years is widely spread, especially among hard wheats. Black chaff (*Bacterium translucens* var. *undulosum*) [ibid., xvi, p. 91] is prevalent in dry seasons on winter wheats, especially in the botanical forms with red ears; the varieties *hostianum* and *velutinum* are apparently immune.

In terminating it is stated that in 1931 about 300 inbred lines were isolated from polymer crosses of four different wheat parents, one of which is resistant to bunt, the second to loose smut, the third to Hessian fly [*Mayetiola destructor*], and the fourth was characterized by good and sufficiently large grain; all the lines isolated were highly resistant to both smuts, some of them being even immune from bunt.

Holton (C. S.) & Heald (F. D.). **Studies on the control and other aspects of bunt of Wheat.**—*Bull. Wash. St. agric. Exp. Sta.* 339, 35 pp., 2 figs., 1936.

In experiments on the control of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], seed treated with copper carbonate dust (50 per cent.) at the rate of 2 oz. per bush. and copper arsenite [*R.A.M.*, xv, p. 344], 2 and 4 oz. per bush., and sown in soil artificially contaminated with bunt, gave, respectively, 4·4, 4·6, and 5·1 per cent. infection in lightly contaminated soil, and 12·5, 11·1, and 8·7 per cent. in the more heavily contaminated soils, as compared with 13·2 and 22·2 per cent. infection, respectively, for the controls.

Basic copper sulphate dust [loc. cit.] used at the rate of 2 oz. per bush. reduced infection on the Federation variety carrying spore loads of 0·1, 0·4, and 1·5 gm. per 120 gm. seed, from 17·5, 39·9, and 44·4 per cent. to 0, 0·02, and 0·1 per cent., respectively, the corresponding figures for Marquis wheat being 3, 11·3, and 33·7 per cent., and 0, 0, and 0·1 per cent., respectively. The effectiveness of the treatment remained unimpaired after one year.

Holding seed treated with copper carbonate dust (20 and 50 per cent., 3 oz. per bush.) for three weeks to nine months before planting did not materially affect the efficiency of bunt control in spring plantings of Federation wheat, but the practice lessened the protective value of [American] ceresan (3 oz. per bush.). Periodic sowings of heavily contaminated Hybrid 128 dusted similarly before the first sowing showed decreasing effectiveness of the three treatments from early

September to late October sowings. On heavily infected Hybrid 128 seed new improved ceresan at ½ oz. gave as good control as ceresan at 2 oz. per bushel.

Copper carbonate dust did not give the same control with different physiologic races of the bunt organisms; poorer control was obtained with races of *T. caries* than with those of *T. foetens*.

Washing the grain [ibid., ix, p. 446; xv, p. 344] reduced infection from 19·1 to 2·9 per cent. on the average, and when used before dusting the seed should make it possible to utilize heavily infected grain with reasonable safety.

Trench seeding gave less infection than normal surface drill seeding in periodic plantings under natural field conditions, and in artificially contaminated soil reduced infection by at least 50 per cent. [see preceding abstract].

Marquis wheat seed, obtained from different regions and uniformly infected with *T. caries*, when planted at Pullman showed from 18·39 to 42·55 per cent. infection, variation in another similar test being greater with *T. caries* than *T. foetens*. Growing the wheat strains for one year at Pullman made them somewhat more uniformly susceptible, while Pullman seed grown for one year in other localities and returned to Pullman for sowing showed variations in the percentages of bunt ranging from 12·6 to 39·9 for *T. caries* and 12·9 to 38·6 for *T. foetens*.

Two new physiologic races of *T. caries* [ibid., xv, p. 287] were found, one of which attacked Ridit wheat rather severely and the other Hohenheimer. A third race of *T. caries* observed in Klickitat County, Washington, and similar to that described by Young [ibid., xiv, p. 350], is distinguished by spore size, prominent reticulations of the spore walls, hard spore balls, poor spore germination, failure to obtain infection by planting affected seed, and excessive tillering and dwarfing of the infected plants. The data obtained indicated that the growing of resistant varieties has led to the increase and spread of new races of *T. caries* and *T. foetens* which may have arisen by hybridization of species or races, or by mutation.

Varietal resistance may vary with the locality owing to the prevalence of different races of bunt. The use of composites of large numbers of races of bunt, however, is not a reliable method of determining absolute bunt varietal resistance since environmental factors may affect reaction, and tests in various localities are recommended. Indices of winter hardness are not obtainable from heavily bunted plantings, and plantings showing winter injury are not reliable for determining bunt resistance.

Vanderwalle (R.) & Larose (E.). **La désinfection à l'eau chaude des semences contre le charbon nu Ustilago tritici Schaf.** [Hot-water disinfection of seed against loose smut, *Ustilago tritici* Schaf.] —*Bull. Soc. Bot. Belg.*, lxix, 1, pp. 39–40, 1936.

This account of the writers' experiments in the control of loose smut of wheat (*Ustilago tritici*) has already been noticed from another source [*R.A.M.*, xv, p. 636].

Tapke (V. F.). **Pathogenic strains in Ustilago nigra.**—*Phytopathology*, xxvi, 10, pp. 1033–1034, 1936.

In field tests on 17 varieties of barley with ten collections of *Ustilago nigra* [*R.A.M.*, xv, p. 791] in May, 1935, the susceptibility of the Himalaya (16·8 per cent. infection) and Nepal (32·0) varieties and the resistance of Lion (2·5) to collection 186 from Wisconsin served to differentiate this strain pathogenically from the rest. In the autumn of the same year, greenhouse experiments confirmed this result when collection 185 (Colorado) again failed to infect Himalaya and Nepal but produced 100 per cent. smutted heads in Lion, while 186 caused 68, 30, and 16·7 per cent. infection, respectively, in the three varieties.

[Jones (G. H.).] **Advice to farmers growing Wheat and Barley for seed.**—*Ahram*, 4th November, 1 p., 1936. [Arabic.]

For the control of flag smut [*Urocystis tritici*] of Hindi wheat (*Triticum vulgare*) raised for seed purposes in Egypt immersion of the seed sown in 2 per cent. solution of copper sulphate for 5 minutes or dusting with cuprous chloride [*R.A.M.*, xv, p. 208] at the rate of 0·5 kg. per ardeb [about 4 per 1,000 by weight] is recommended. Planting should be carried out by the afir method [by which the seed is broadcast on dry land, lightly harrowed, and then irrigated immediately]. Hindi seed wheat should be planted preferably in Upper Egypt, where flag smut is less prevalent and wherever possible on land not sown to Hindi wheat for several years. Beladi wheat (*T. durum*) is immune from the disease.

Frutchey (C. W.). **A study of Stewart's disease of Sweet Corn caused by Phytomonas stewarti.**—*Tech. Bull. Mich. agric. Exp. Sta.* 152, 25 pp., 5 figs., 1936. [Abs. in *Exp. Sta. Rec.*, lxxv, 5, pp. 642–643, 1936.]

Following a review of the work of previous investigators on bacterial wilt of maize (*Phytomonas* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xvi, p. 113], the writer emphasizes the great economic importance of the disease and describes its symptoms in detail. He has never been able to isolate the causal organism from the soil or from the embryo of the seed, but obtained it repeatedly from the extra-embryonic portions of seed from infected plants; it was shown to be incapable of invading the uninjured embryo at the time of germination.

Definite proof is further adduced of the implication of the seed-corn maggot (*Hylemyia* [*Phorbia*] *cilicrura*) in the transmission of *A. stewarti* from the infected to the healthy part of the seed, the bacterium having been isolated both from the exterior and interior of larvae of the insect. The common wheat wireworm (*Agriotes mancus*) was also found to act as a mechanical carrier of bacterial wilt, but appears to be unable to harbour the organism for any length of time.

A *Fusarium* and a white bacterium, possibly related to *Phytomonas* [*Bacterium*] *dissolvens* [ibid., xii, p. 426], were sometimes found associated with *A. stewarti*, the former causing a virulent foot rot which quite eclipses the bacterial wilt, while the latter may serve to pave the way for

the entrance of *A. stewarti* by invading and rotting away the tissues of the vascular system.

The use of resistant maize varieties appears to be the sole means of combating bacterial wilt, surface sterilization of the infected seed having proved ineffectual, while internal disinfection without injury to the embryo was impracticable in the writer's experiments.

The author concludes that infected seed, insect transmission, and the organisms associated with *A. stewarti* are the main factors in the propagation of bacterial wilt. Although the bacterium can be isolated from seed produced by affected plants, little or no disease develops in the progeny from such seed in the absence of other factors, owing to the freedom of the embryo from the organism and the inability of the latter to migrate unaided from the chalazal region to the vascular tissue of the seedlings. Insects feeding on the roots and old kernels of the seedling may disseminate infection either by themselves carrying the organism or by contact in the case of diseased seed. Morphological and other data indicate that general infection of a maize plant with *A. stewarti* occurs at the base, where large numbers of vascular bundles are involved, whether the inoculum is contained in the seed or carried by insect larvae.

HARRIS (M. R.). **The relationship of Cephalosporium acremonium to the black-bundle disease of Corn.**—*Phytopathology*, xxvi, 10, pp. 965–980, 2 figs., 1936.

Black bundle disease of maize has been generally attributed to the invasion of the vascular bundles by *Cephalosporium acremonium* [*R.A.M.*, x, pp. 180; xii, p. 505; xv, p. 360], but in the present study on material consisting of inbred strains from California, Illinois, and Wisconsin, the condition was found to be primarily due to a deposit of a gum-like substance in the cells and vessels of the bundles, associated with the fungus in less than 4 per cent. of the total number (420) of samples examined. The gum was found on microchemical analysis to contain small quantities of pentoses, which serve as food for *C. acremonium*.

In one inbred strain the gum deposit in the vascular bundles was shown to be a concomitant of hereditary characters, besides being influenced by environmental conditions. In controlled experiments black bundles were produced in one strain by limiting the water supply and in another by providing the plants with a phosphorus-deficient nutrient solution. Certain strains reacted to the severe drought of 1930 by the development of black bundles in the field, while in one line the disorder resulted from cultivation in phosphorus-deficient soil.

Inoculation tests with *C. acremonium* on maize seedlings of the several strains under observation gave negative results, while the planting of diseased seed failed to result in the establishment of the fungus in the growing plant. The organism was found, however, in older plants derived from strains with gum-filled vascular bundles, infection having evidently occurred after the tasseling-out of the stalks and following severe root injury. In none of the experiments was *C. acremonium* found to be an active pathogen attacking normal vascular bundles through unwounded root systems.

HOPPE (P. E.) & HOLBERT (J. R.). **Methods used in the determination of relative amounts of ear rot in Dent Corn.**—*J. Amer. Soc. Agron.*, xxviii, 10, pp. 810–819, 5 graphs, 1936.

The purpose of this paper is to describe certain aspects of the technique used in connexion with the co-operative breeding of maize for resistance to ear rots [*Gibberella moniliformis*, *G. saubinetii*, *Diplodia zeae*, *Nigrospora* sp., and miscellaneous fungi] in Illinois [*R.A.M.*, xv, p. 793].

The first study involved methods of measuring infection in field samples. The percentage of rotted ears was determined by count in each of 37 hybrids and varieties from 50-hill populations. The percentage of rotted kernels in the shelled grain from the same samples was then ascertained, using 200- to 300-gm. samples for analysis. A comparison of the results from the two methods of determining ear rot in these identical samples showed the ear separation method to have given very inaccurate results, but a modification of this method, involving the determination of the percentage of rot by weight, proved more efficient. Harvestings delayed until December not only ran considerably higher in ear rot than those collected in October, but the differentials between resistant and susceptible strains were widened in the former.

A statistical analysis of variability showed that the determinations on the 200-gm. samples were as accurate in 95 per cent. of the cases as the results obtained from 400-gm. samples.

Scab disease of Lemons.—*Agric. Gaz. N.S.W.*, xlvii, 10, p. 568, 1936.

In the control of scab (*Sporotrichum citri*) [*Sphaceloma fawcettii scabiosa*: *R.A.M.*, xiv, p. 162; xv, p. 436] of lemon in New South Wales, growers are warned that the closest attention is required to the time of application of the Bordeaux oil (6–4–80–½) spray, viz., after half but before all the petals have fallen. Moreover, the spray must be applied thoroughly to be effective.

MCLENNAN (E[THEL] I.). **Notes on the organisms causing brown rot of Citrus fruit in Victoria, Australia (Phytophthora citrophthora (Sm. & Sm.) Leon. and P. hibernalis Carne).**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 96–103, 1 pl., 2 figs., 1936.

Isolations from lemons and oranges affected by brown rot in Victoria from 1931 to 1933 yielded *Phytophthora citrophthora* and *P. hibernalis* [*R.A.M.*, xv, p. 280], the former being constantly present in material collected in the autumn and the latter in the spring lots. Brown rot being more prevalent in the autumn under local conditions, *P. citrophthora* may be regarded as the chief agent of the disease in the State. Cultures of this fungus obtained from Queensland and the United States were compared with the Victorian isolations and showed the Australian to differ from the American strains in the consistency and topography of the cultures. Tucker has suggested [ibid., x, p. 754] that a more careful investigation of the *Phytophthora* spp. isolated from citrus in the tropics might lead to their transference from *P. citrophthora* to *P. palmivora*, but in the writer's experiments the former made

no growth at 32° C., and the latter developed profusely, whereas at 5° the situation was reversed. Moreover, no sexual organs developed as a result of mating the various Australian isolations with the rubber and cacao strains of *P. palmivora*, but they were formed freely in consequence of fusion between the latter. These differences are regarded as sufficient to exclude *P. palmivora* from implication in the Victorian form of brown rot.

Haas (A. R. C.). **Phosphorus deficiency in Citrus.**—*Soil Sci.*, xlii, 2, pp. 93–116, 6 pl., 1936.

In this full account of an investigation conducted at the California Citrus Experiment Station on the deficiency phase of phosphorus nutrition in citrus by the use of soil, sand, and solution cultures it is stated that the symptoms produced on citrus leaves are variable, consisting in fading of the chlorophyll, burning of the leaf-blade, reduction in foliar dimensions, or the development of a dull, brownish-green tinge. The shape and contents of affected lemon leaf cells undergo certain changes: there is increased shoot growth, but this is almost exclusively terminal; in severe cases the leaves not only burn but are brittle to the touch and droop at the petiole in a direction parallel to the shoot axis and later absciss.

Risbec (J.). **Les parasites du Caféier en Nouvelle-Calédonie.** [Coffee parasites in New Caledonia.]—*Agron. colon.*, xxv, 226, pp. 105–123, 1936.

Hemileia vastatrix is stated to be the most serious pathogen of coffee in New Caledonia, where it was first observed in 1911 at Ponérihouen, and rapidly spread throughout the island. The relatively resistant Robusta type was introduced as an emergency measure to replace the Arabica bushes destroyed by the disease, but by degrees all attempts to combat the fungus have been allowed to lapse. In this connexion attention is drawn to the comparative vigour of Arabica bushes with brown shoots, which suffer less severely from *H. vastatrix* than those with green ones.

Stilbum nanum [?*Marasmius pulcher*: *R.A.M.*, vi, p. 127] is also prevalent in the Colony, but causes much slighter damage than the foregoing. The Robusta types are chiefly affected. Good control may be effected by spraying with Bordeaux mixture. This fungus is liable to attack various other plants, including the shade tree *Acacia lebbek*. It forms black, circular spots on coffee leaves, which become detached but remain suspended along the branches by the slender, black hyphal cords of the organism.

McDonald (J.). **The susceptibility of Harar Coffee to disease.**—*Mon. Bull. Coffee Bd Kenya*, ii, 22, p. 191, 1936.

Seedlings of the promising Harar variety of Arabica coffee introduced into Kenya in 1931 have been found in tests at the Scott Agricultural Laboratories to show unsatisfactory disease-resistance qualities. It is abnormally susceptible to the economically unimportant *Cercospora*

coffeicola [*R.A.M.*, xiv, pp. 31, 397] and appears to be at least as susceptible to leaf disease (*Hemileia vastatrix*) [ibid., xv, p. 798] as the French Mission type. Eight five-year-old bushes in August, 1936, showed up to 50 per cent. infection by berry disease (*Colletotrichum coffeanum*) [*Glomerella cingulata*: ibid., xvi, p. 86], though infection was very slight on most.

Verderevski (D. D.), Lebedeva (Mme O. P.), Vassin (P. F.), Vyskvorko (G. G.), Djelaloff (R.), & Moskovetz (S. N.). Гоммоз Хлопчатника. Материалы к построению системы мероприятий. [Gummosis of Cotton. Materials for the elaboration of a system of control measures.]—*Закавказский н.-исслед. хлопк. Инст., научн. Сер.* [*Publ. Transcauc. sci. Res. Inst. Cotton, Sci. Ser., Tiflis*], 52, 168 pp., 17 figs., 1 map, 26 graphs, 8 diags., 1935. [English summaries. Received November, 1936.]

In this collection of papers a brief historical, biological, and morphological account is first given of the blackarm or gummosis disease (*Bacterium malvacearum*) of cotton, together with a summary of the results of investigations in 1933 and 1934 on the etiology and control of the disease in Transcaucasia and Armenia [*R.A.M.*, xvi, p. 35, and next abstracts]. Laboratory experiments showed that immersion of cotton seed for from 5 to 15 minutes in formalin (1 in 100), followed by covering for 2 hours, completely controlled surface infection of the seed, without unduly interfering with the germinability, while treatment of the seed with sulphuric acid did not entirely destroy the parasite. In field plots raised from formalin-treated seed infection was about half that present in control plots, while in plots raised from seed treated with sulphuric acid it was reduced only by some 30 per cent. In Azerbaijan cotton sown very early in the season (March to early April) or late in May showed a lesser degree of infection than normal sowings (second half of April to the beginning of May).

In the last paper, Lebedeva states that *Bact. malvacearum* was obtained in pure culture in both years from aseptically dissected pieces of cotton seeds (exclusively from badly infected bolls) that had been delinted for 30 minutes in sulphuric acid of 1·8 sp. g., after which they were immersed in a 0·1 per cent. mercuric chloride solution for 10 minutes and then washed four times in sterile tap water, thus demonstrating internal infection of the seeds by the organism [cf. ibid., xiii, p. 766]. The bacterium was never isolated, however, from seed collected from infected plants, unless the lint showed visible signs of infection. There was evidence that it was only present in the fleshy portions of the seed, and it is suggested that invasion takes place from the infected lint before the hardening of the seed-coat. Internal infection was found in practically all the seeds from infected bolls that were examined, but it is not believed to play an important part in the dissemination of the disease owing to the fact that badly diseased bolls are generally excluded at the harvest. There also was evidence that less than 50 per cent. of such seeds germinate after sowing, and isolations from the seeds that failed to grow up indicated that they mostly contained only the saprophytic yellow bacterium, which frequently accompanies *Bact. malvacearum*, and *Alternaria tenuis*.

Babayan (A. A.), Kirakossyan (A. V.), & Bezhanyan (Z. S.). Материалы по изучению гоммоза Хлопчатника и по борьбе с ним в ЗСФСР. [Contribution to the knowledge of Cotton gummosis and to its control in Transcaucasia.]—*Закавказский н.-исслед. хлопк. Инст., научн. Сер.* [*Publ. Transcauc. sci. Res. Inst. Cotton, Sci. Ser., Tiflis*], 46, 96 pp., 1935. [English summary. Received November, 1936.]

A concise, tabulated account is given of the investigations carried out up to the end of 1933 in Armenia, and partly also in Azerbaijan, on the biology and control of the blackarm disease of cotton (*Bacterium malvacearum*) [see preceding and next abstracts]. It was shown, *inter alia*, that the causal organism in pure culture withstood constant freezing, with occasional falls of temperature as low as —27·8° C. for a whole month in 1933, but died out during the subsequent three or four weeks, when periods of freezing alternated with warmer spells, during which the thermometer showed temperatures up to 10·6°. In infected cotton leaves the bacterium survived two months when buried under snow, but was killed within a month when periods of thawing alternated with frosts. In one series of tests pieces of infected cotton plants were buried in soil in pots, and exposed to outdoor winter conditions, but no infection resulted when disinfected cotton seed was sown in the pots at the end of the spring. Furthermore, while living bacteria could be still found in cotton plant debris in the field at the beginning of March, 1933, all were found to be dead in the debris tested at the end of the same month. In another series of experiments it was shown that *Bact. malvacearum* on naturally infected cotton seed withstands a temperature of 90° C. for 5 hours in a dry, and for not less than 1 hour in a damp, atmosphere, while in pure culture it was killed within 20 minutes at 50° and within 10 minutes at 56°.

Delinting the cotton seed with sulphuric acid gave almost complete control of the disease in 1933, and secondary field infection of the seedlings raised from the treated seed was very limited. Seed disinfection of the seed with 1 in 100 formalin is also recommended because of its efficacy, cheapness, and ease of application. The incidence of the disease was markedly increased by poor tillage of the soil, belated thinning out of the cotton stands, and too late flooding. Egyptian and American Upland cotton varieties transplanted from hotbeds were significantly less susceptible to the disease than plants grown in the field. While all the cotton varieties tested were found to be susceptible, the highest degree of resistance was found in the King Karajaz variety among the Uplands, and in the Sakel 473 and 465, and Mela bessa 1474 varieties among the Egyptians.

Smith (H. P.), Jones (D. J.), Killough (D. T.), & McNamara (H. C.). **Chemical dust treatment of Cottonseed for planting purposes.**—*Bull. Tex. agric. Exp. Sta.* 531, 24 pp., 1936.

The results [which are fully tabulated and discussed] of experiments in progress since 1930 in various localities of Texas to determine the effect on cotton stands and yields of different methods of treating and delinting fuzzy (gin-run) seed showed an increase both in seedling

emergence (denoting control of *Colletotrichum* [*Glomerella*] *gossypii* [*R.A.M.*, xv, p. 149] and *Rhizoctonia* [*Corticium*] *solani* [loc. cit.]) and yield in the ceresan-treated (4 oz. per bush.) lots, the former ranging from 11 to 65 and the latter from 4 to 25 per cent. under optimum planting conditions. The emergence of mechanically delinted seed was also increased by treatment with ceresan which reduced the incidence of angular leaf spot [*Bacterium malvacearum*: ibid., xv, p. 214, and preceding and next abstracts] in plants raised from seed delinted with hydrochloric acid or sulphuric acid [ibid., xiv, p. 562].

In the tests at Lubbock in the High Plains region of the State the total number of cotton seedlings emerging generally increased with the lateness of the sowing date from 25th April to 25th May, while thinning the cotton to a 12-in. spacing augmented the yields of both treated and untreated fuzzy and delinted seed.

Neither Bayer dust 502 nor copper carbonate proved equal to ceresan for the purposes in view, but promising indications (requiring further confirmation) were given by treatment of the seed with commercial hydrated lime at the rate of 3 oz. per bush.

MASSEY (R. E.). **Section of Botany and Plant Pathology, A.R.S. Report by Mr. R. E. Massey on experimental work carried out by the staff of the section during season 1934–35.**—*Rep.* [*Gezira*] *agric. Res. Serv.*, *1935*, pp. 34–55, [1936. Mimeographed].

In 1934, cotton blackarm [*Bacterium malvacearum*: *R.A.M.*, xiv, p. 757; xv, pp. 426, 437, and preceding abstracts] appeared earlier in the Gezira area of the Sudan than during the previous season, but owing to the absence of heavy late rains, spread was slow and generally localized.

Flooding of the land after the clearance of the debris from the previous crop resulted in the germination of enormous numbers of seedlings from fallen seed-cotton, and as a number of these became infected with blackarm, a second clearance before sowing is clearly indispensable. In two large-scale experiments in Hag Abdullah and Suleimi, over 17 pairs of selected plots averaged 5·9 and 37·7 per cent. blackarm infection in the flooded and unflooded control areas, respectively. In 13 out of the 17 cases, over five times as many infected plants were found in the untreated as in the treated area. Laboratory experiments showed that when clean cotton seed sown in mixtures of fresh, infected debris and Gezira or Shambat soil, and flooded with river water for various periods, the debris lost most of its infective power after 2 to 4 days' flooding, and was innocuous after 5 days' flooding. When the soil was replaced by sand, the infective power lasted longer, and when sand and tap water were used infections were obtained even after 8 days' flooding.

Observations on plots scattered over the central part of the Gezira showed the presence of isolated plants heavily infected with blackarm to be a peculiar feature of the season, and due to infected debris blown over during the cleaning of old cotton land. The concentration of infection on the side of the plots nearest the old cotton land was much less marked than hitherto. Flooding land occupied by cotton the previous season largely eliminated infection from this source, and considerably reduced volunteer seedlings. Spectacular evidence was obtained of the rapid spread of infection throughout the plot from small,

isolated centres. It was found impossible to exclude blackarm completely from isolated plots in any area in the Gezira during the rainy season, but considerable control results from sowing in such plots.

Seed disinfection tests with standard abavit B and a home-made dust of similar composition showed both to be about equally effective against blackarm. Laboratory studies again demonstrated that cotton seedlings take blackarm much more readily when turgid than when partially wilted [ibid., xvi, p. 68].

Leaf curl was noticed as early as 24th September, corresponding with the early breeding of the whiteflies [*Bemisia gossypiperda*]. Spread, however, was slow, and finally the percentage of infection even lower than in the previous season.

No general outbreak of wilt [ibid., xiv, p. 756] occurred, but the presence of discoloured seed-cotton in the terminal bolls indicated the occurrence of disturbances in the underground parts.

The evidence obtained in two widely different, successive seasons indicated that in the Gezira a disturbance to the root system of the cotton crop takes place between the end of September and the beginning of December. The finest rootlets decay and are attacked by fungi. The extent of the damage varies in different soils, and is symptomatic of the physical nature of the soil and its reaction. The mycorrhizal fungus [ibid., xiv, p. 756] was present, but it had no adverse effect on root development. No other organisms were found to any great extent until late in October. Isolations from 5- to 9-days-old wilted seedlings then gave *Pythium graminicolum* [ibid., xv, pp. 137, 465], *P.* sp. section *Aphragmium* (?*P. afertile* Kanouse & Humphrey), and *P. aphanidermatum*. Isolations from the fine rootlets of plants not visibly wilted, in August and September, also yielded various species of *Fusarium*, of which *F. solani* var. *minus* was the commonest, as well as *Rhizoctonia* [*Corticium*] *solani*, *Macrophomina phaseoli*, a slow-growing, as yet unidentified fungus labelled 'XT', *F. vasinfectum* var. *inodoratum*, *Ascochyta gossypii*, and *Moniliopsis aderholdi*, found inside unhealthy roots, and considered to be probably a weak parasite.

When cultures of these fungi were added to the sand in which cotton seedlings were grown in the laboratory under normal temperature and moisture conditions, *P. aphanidermatum* often produced death in a few days, but, while certain of the others penetrated rootlets, none was strongly parasitic. Addition of 0·1 per cent. sodium carbonate severely damaged the root system in the presence or absence of fungi. Without the carbonate the fungi caused little damage, though commonly invading the finest rootlets. The plants exhibited marked resistance as long as aeration of the roots remained satisfactory.

Observations on cylinders of soil in which the original tilth was maintained showed that in many instances the uppermost layers become compacted under irrigation, forming a seal which rapidly grows increasingly impermeable to air and water. This sealing of the subsoil, to which the puddling produced in the upper layers by heavy rain also contributes, is considered to be responsible for the root disturbance. The methods of cultivation practised in the Gezira are not deep enough to admit air to the lower layers, especially in October, when the crop has attained a considerable size. Cotton withstands waterlogging well

if the water is aerated, and the algae in the Blue Nile are thought to play an important part in preventing root asphyxiation when cotton is over-watered. Occurring as they do at a critical growth phase, the root disturbances are probably largely responsible for the low yields in the Gezira. After a date which varies somewhat annually, very little recovery is possible from maltreatment in the earlier growth stages. Work in 1935–6 confirmed in general these observations.

ANDREWS (F. W.). **The effect of leaf curl disease on the yield of the Cotton plant.**—*Emp. Cott. Gr. Rev.*, xiii, 4, pp. 287–293, 1 graph, 1936.

To estimate the effect on yield of cotton leaf curl [see preceding abstract] a small plot of Sakel cotton was sown on 15th October, 1932, instead of at the normal time about the beginning of August, so that the plants developed at the period when the disease was rapidly decreasing and the selection of comparative pairs of healthy and infected plants for observation could readily be made. In all, 88 comparable pairs were secured. On 27th March, 1933, the plants were cut out at ground-level, and the following records obtained. The total numbers of green bolls, open bolls, and buds and flowers on the 88 diseased plants were, respectively, 558, 243, and 157, while on the healthy plants the corresponding figures were 1087, 473, and 164, the relative percentage reductions due to the disease being, respectively, 48·6, 48·6, and 4·3. In the healthy plants the average fresh weight per plant, unit weight of green bolls, and average weight of seed cotton per unit open boll were, respectively, 236·3, 6·2, and 1·47 gm., the corresponding figures for the infected plants being 126·8, 5·8, and 1·37 gm. In the healthy and diseased plants, respectively, the fresh weight of the stems and leaves per plant amounted to 140·9 and 102·8 gm., the percentages of green and open bolls in the former being 69·6 and 60·3, respectively, and in the latter 69·5 and 30·4.

The disease thus caused a significant reduction in the fresh weight of the infected plants and a considerable decrease in their fruit production. The data suggest that the full effects of the disease were apparent only in the green bolls, and that infection occurred too late to cause any significant decrease in the unit weight of seed cotton in the open bolls. Since the plants were sown out of season the loss of cotton cannot be taken as representing the normal reduction due to the disease.

LEROY (J. V.). **Observations relatives à quelques Hémiptères du Cotonnier.** [Observations on some Cotton Hemiptera.]—*Publ. Inst. nat. Étud. agron. Congo Belge*, Sér. sci., 10, 20 pp., 18 col. pl., 9 figs., 1936.

The author presents experimental data showing that *Lygus vosseleri* is responsible for the malformation of cotton known in the Belgian Congo as frisolée [ibid., xv, p. 147], which appears to be the same as that described by O. F. Cook as tomosis [loc. cit.]. A marginal rolling of the leaves towards the base, with a reddish coloration, is attributed to *Empoasca fascialis*, and cankers on the stems, leaves, and capsules to *Helopeltis bergrothi* [ibid., xv, p. 499].

Neal (D. C.) & Collins (E. R.). **Concentration of ammonia necessary in a low-lime phase of Houston clay soil to kill the Cotton root-rot fungus, Phymatotrichum omnivorum.**—*Phytopathology*, xxvi, 10, pp. 1030–1032, 1936.

In order to obtain an idea of the concentration of ammonia necessary to destroy the cotton root-rot fungus (*Phymatotrichum omnivorum*) [*R.A.M.*, xv, p. 718] in low-lime Houston clay (black belt) soils in Texas [ibid., xiii, p. 92], laboratory experiments involving soil treatments with ammonia water and subsequent inoculations with the fungus were conducted in the spring of 1935, 750 gm. of soil being used for each concentration of ammonia tested from 300 to 1,325 p.p.m. in increments of 75 p.p.m. The results of the tests indicated that the effective initial concentration of ammonia in the soil lies in the range of 900 to 1,025 p.p.m.—a marked contrast to the low strengths required for the destruction of the mycelium and sclerotia of the fungus (50 and 300 p.p.m., respectively) in Erlenmeyer flasks.

Rogers (C. H.). **Cotton root-rot and weeds in native hay meadows of central Texas.**—*J. Amer. Soc. Agron.*, xxviii, 10, pp. 820–823, 1936.

The root-rot fungus, *Phymatotrichum omnivorum* [see preceding abstract], is stated to have been repeatedly found destroying plants in undisturbed blackland prairies [*R.A.M.*, xv, p. 577]. Vigorous sclerotia of the fungus were found at 1-, 2-, and 3-ft. depths in the soil in one such meadow in the western edge of Falls County. Of a total of 47 plant species present in the meadow, 37 were more or less susceptible to *P. omnivorum*, including *Aster multiflorus*, *Daucus pusillus*, *Delphinium albescens*, two species of *Gaillardia*, *Geranium carolinianum*, *Lathyrus pusillus*, *Lupinus texensis* [*L. subcarnosus*], *Oenothera missouriensis*, *Physalis mollis*, *Solanum carolinense*, *S. elaeagnifolium*, and *Vicia leavenworthii*. Among the seven resistant forage grasses were *Andropogon furcatus*, *A. scoparius*, *Bromus catharticus*, and *Hordeum pusillum*. A number of additional plants were found to be susceptible in other prairie meadows, including two species of sunflower (*Helianthus maximiliani* and *H. annuus*) and *Solidago altissima* [*S. pilosa*].

The maintenance of meadows and pastures free of weeds is recommended as a means of starving out the root-rot fungus.

Dobrisler (C.). **A Fusarium-like species of Dactyella capturing and consuming testaceous rhizopods.**—*J. Wash. Acad. Sci.*, xxvi, 10, pp. 397–404, 1 fig., 1936.

Latin and English diagnoses, supplemented by a full discussion of the morphology and taxonomy of the organism, are given of *Dactyella passalopaga* n.sp., found capturing and consuming the testaceous rhizopods *Geococcus vulgaris* and *Euglypha laevis* in agar plate cultures from decaying plant roots, soil, and leaf mould in Maryland [cf. *R.A.M.*, xiv, p. 508; xv, p. 720].

Shrewsbury (J. F. D.). **Secondary thrush of the bronchi.**—*Quart. J. Med.*, N.S., v, 19, pp. 375–397, 1936.

The writer fully describes and discusses in relation to contemporary

researches the results of his observations, covering a three-year period, on the disease to which Castellani has applied the name of 'bronchomoniliasis' and attributes to species of *Monilia* [*Candida*]. On the basis of the data here presented the disorder in question, as understood by Castellani, does not exist in England, where, however, secondary thrush infections of the bronchi due to *M.* [*C.*] *albicans* [see next abstracts] undoubtedly do occur and are of some importance on account of the additional strain which they tend to throw on the respiratory mechanism [cf. *R.A.M.*, xii, p. 692 *et passim*]. This fungus is commonly present in human sputum, irrespective of the nature of the primary pulmonary disease. In the writer's opinion, the organisms grouped by Castellani under *Monilia* are merely strains of *C. albicans*.

Ikeda (K.). **Bronchopulmonary moniliasis: its relation to obscure chronic pulmonary infection.**—*Arch. Path. Lab. Med.*, xxii, 1, pp. 62–81, 5 figs., 1936.

Since Castellani's observations in 1905 on bronchopulmonary moniliasis among Cingalese tea workers, this condition has been regarded as a clinical entity. In the present study attention is drawn to the existence of an apparent relationship between a pathogenic species of *Monilia* (*M.* [*Candida*] *albicans*) [*R.A.M.*, xvi, pp. 40, 99] and chronic interstitial pneumonia of obscure etiology, associated with bronchiectasis and abscesses. The results of the writer's investigations further suggest a sequential relation of a certain type of chronic bronchial asthma to bronchopulmonary moniliasis [cf. preceding abstract], the former representing an early phase of the latter. *C. albicans* may therefore be considered as an important etiological factor in the development of obscure bronchopulmonary infection, but whether it is the sole cause of the disease cannot be stated on the basis of present evidence.

Hopkins (E. W.) & Hesseltine (H. C.). **Cultural and morphological studies of Cryptococci and Monilias isolated from vulvovaginitis and oral thrush.**—*J. Lab. clin. Med.*, xxi, 11, pp. 1113–1118, 1936.

Fermentation groups were determined in 8 *Cryptococcus* [*R.A.M.*, xv, p. 367] and 73 *Monilia* strains isolated from cases of vulvovaginitis and oral thrush. Of the 35 strains biochemically classifiable as *M.* [*C.*] *albicans* [see preceding and next abstracts], 31 belong morphologically to this species, two are referable to *M. candida* [*C. vulgaris*], and two probably to *M.* [*C.*] *krusei* [ibid., xv, p. 439]. Cultural characters of the three types are described.

Bearse (C.) & Pollock (L. H.). **Mycotic infection of the stomach: report of a case with perforation.**—*Ann. Surg.*, civ, 2, pp. 167–174, 1 fig., 1936.

Full clinical details are given of a fatal case of abdominal abscess and gastric fistula in a 24-year-old American negress, associated in what is believed to have been an etiological relationship with *Monilia* [*Candida*] *albicans* [see preceding and next abstracts].

Persons (E. L.) & Martin (D. S.). **Passive transfer antibodies for six saprophytic fungi in a patient with a superficial scaling dermatosis.** —*J. clin. Invest.*, xv, 4, pp. 429–434, 1936.

A 33-year-old man, without any family history of hypersensitiveness, developed a generalized scaling dermatosis some 5 weeks after the appearance of an epidermal reaction round a pustule on the thigh. Cultures from the initial lesion, after the development of the dermatosis, yielded Benham's pink *Cryptococcus* [*R.A.M.*, xv, p. 153], *Cladosporium herbarum*, *C.* sp., *Penicillium roseo-citreum*, *Aspergillus fumigatus* [ibid., xv, p. 20 *et passim*], *Nigrospora* sp., and an unidentifiable fungus with a sterile mycelium. Skin tests with saline suspensions of heat-killed organisms from 48-hour growths on Sabouraud's glucose agar slants resulted in immediate reactions to all the strains except the *Cryptococcus*. Cutaneous sensitivity to each of the six fungi was passively transferred to the skin of three normal persons. Passive transfer tests were positive in two out of three subjects to *Alternaria* (from dust) [cf. ibid., ix, p. 384] and in two to *Monilia* [*Candida*] *albicans* [see preceding and next abstracts] extract 1 : 100.

There is reason to believe that hypersensitivity to moulds was an important factor in the development of dermatosis in the writers' patient, and it would appear from the evidence here presented that saprophytic fungi should be regarded as possible incitants of allergic dermatoses, as well as of hay-fever [ibid., x, p. 313 *et passim*] and asthma [ibid., xiii, p. 370 *et passim*].

Worley (G.) & Stovall (W. D.). **A study of milk coagulation as a differential feature of Monilia albicans and Monilia candida.**—*Proc. Soc. exp. Biol., N.Y.*, xxxv, 1, pp. 165–168, 1936.

A definite biological difference was shown to exist between *Monilia* [*Candida*] *albicans* [see preceding abstracts] and *M. candida* [*Candida vulgaris*: *R.A.M.*, xvi, pp. 40, 99] in respect of milk coagulation, a process readily effected by the former but not by the latter.

Mosher (W. A.), Saunders (D. H.), Kingery (L. B.), & Williams (R. J.). **Nutritional requirements of the pathogenic mold Trichophyton interdigitale.**—*Plant Physiol.*, xi, 4, pp. 795–806, 1936.

A tabulated account is given of the writers' studies on the amino acid, carbohydrate, nutrilite (vitamin-like substances), and mineral requirements of *Trichophyton interdigitale* [*R.A.M.*, xvi, p. 101]. The fungus proved incapable of growth on a synthetic medium unless supplied with certain amino acids, preferably in the form of a varied assortment comprising the almost indispensable leucine, aspartic acid (or asparagin), and α-amino-β hydroxy-n-butyric acid (Rose). All the more common sugars tested were utilized by the fungus except lactose, but the best growth was afforded by mannose. *T. interdigitale* further requires, in addition to the foregoing, at least one of the growth-promoting substances, pantothenic acid, crystalline vitamin B [ibid., xv, p. 170], or a lactoflavin preparation. An extension of the growth period can be secured by the use of an abundance of phosphate as a buffer in the nutrient solution.

Maschkilleisson (L. N.). **Zur Frage über Trichophytia superficialis capillitii adultorum.** [A contribution to the question of superficial trichophytosis of the scalp in adults.]—*Derm. Wschr.*, cii, 24, pp. 765–769, 5 figs., 1936.

Apart from 606 cases of superficial trichophytosis and microsporosis of the scalp among adults recorded down to 1934 the writer has personally examined 53 patients (all female) between the ages of 18 and 69 affected by this disorder in the Moscow and Voronezh districts of the U.S.S.R. Cultures from 24 of these cases yielded *Trichophyton violaceum* [*R.A.M.*, xvi, p. 101] (18), *T. gypseum* [ibid., xv, p. 650] (4), *T. niveum* [ibid., xv, pp. 222, 501] (1), and *T. crateriforme* [ibid., xv, pp. 218, 580] (1). The relationship of the condition to various pathological and constitutional factors is briefly discussed.

Nicolas (J.), Massia (G.), Rousset (J.), & Colas (J.). **Onychomycose du gros orteil.** [Onychomycosis of the big toe.]—*Bull. Soc. franç. Derm. Syph.*, *1936* (i), 5, pp. 924–926, 2 figs., 1936.

Details are given of case of onychomycosis of the left big toe, in an elderly male patient, associated with infection by *Scopulariopsis brevicaulis* [*R.A.M.*, xv, p. 581].

Artom (M.). **Onicomicosi da Scopulariopsis brevicaulis (varietà hominis).** [Onychomycosis caused by *Scopulariopsis brevicaulis* var. *hominis*.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xv, 3, pp. 208–209, 1936.

From the swollen, brittle, whitish nails on both hands of an 11-year-old boy the writer isolated on Sabouraud's agar a fungus which he describes and identifies as *Scopulariopsis brevicaulis* [see preceding abstract] var. *hominis*.

Hausam (W.). **Ueber einen neuen, durch farbstoffbildende Mikroorganismen verursachten Schaden an Schafleder.** [On a new injury to sheepskin caused by pigment-forming micro-organisms.]—*Collegium, Haltingen*, x, 798, pp. 561–566, 15 figs., 1936.

A species of *Dematium*, forming a greenish- to tar- or lacquer-black pigment in beer wort agar cultures, liquefying gelatine, peptonizing milk, and producing a small amount of acid from galactose and dextrose, was isolated from circular, sharply-defined, greyish- to brownish-purple spots, 0·25 to 0·5 cm. in diameter, on a sheepskin. This is believed to be the first record of a *Dematium* damaging leather. The fell also bore greyish, speckled lesions due to *Aspergillus niger* and to green and yellow species of *Penicillium* [*R.A.M.*, ix, p. 316]. Infection by the *Dematium* is believed to have been contracted on the drying-floor.

Gigante (R.). **Una nuova virosi della Rosa in Italia.** [A new virus disease of Rose in Italy.]—*Boll. Staz. Pat. veg. Roma*, N.S., xvi, 2, pp. 76–94, 2 pl., 14 figs., 1936.

In March, 1936, Hadley, Frau Karl Druschky, His Majesty, and Oberbürgermeister roses in a garden near Rome, in which some years before a few individuals had been similarly affected, developed a serious virus disease not hitherto recorded.

The leaves at the extremity of the young branches became contorted and swollen, forming a rosette. Blackish-brown, round or polygonal spots 2 to 3 mm. in diameter appeared on the leaf blades, and circular or elliptical, light brown necrotic areas 1 to 5 mm. in diameter and sharply delimited by a thin, blackish halo formed among the spots or on the healthy part of the leaves. Defoliation set in, and dark brown areas girdled the stems and branches. The flowers were frequently deformed, and in severe cases the whole plant died. Occasionally the symptoms remained masked in new shoots for over a year.

Sap inoculations into healthy plants gave positive results in all cases, the controls remaining unaffected. Transmission was also effected in 4 out of 7 cases by means of a species of *Macrosiphum* from diseased roses. In nature the disease is apparently spread by contact wounds made by diseased plants, by contaminated pruning implements, and chiefly by *Macrosiphum* sp. A healthy plant protected by gauze covering in a greenhouse remained healthy for some time but three weeks after the removal of the covering developed the disease, and bore numerous aphids.

Control consists in adequate spacing, prompt destruction of diseased plants, disinfection of pruning implements, grafting with healthy parts only, the removal from the vicinity of wild roses, especially *Rosa indica* var. *major*, as these are highly susceptible, and insecticidal treatment.

White (H. L.). **Anther smut of perpetual-flowering Carnations.**—*Gdnrs' Chron.*, c, 2597, p. 254, 1 fig., 1936.

Ustilago violacea [*R.A.M.*, xiii, p. 453], ordinarily an unimportant pathogen of carnations, occurred in a severe form in 1936 in a nursery near London, necessitating the destruction of up to 70 per cent. of the blooms prepared for marketing. Infected flower-stalks are stunted and the developing bud is squat; later there is a marked tendency to splitting of the calyx. As many as six or eight axillary buds may be formed before the opening of the terminal one. Anther smut may be perpetuated by means either of contaminated cuttings or of spores, infection being favoured by the retention of stagnant moisture in the leaf axils and the damp atmosphere of the beds in glasshouses. Buds observed to be carrying the smut should be excised and burnt.

Rainio (A. J.). **Tutkimuksia Gladiolus-kasvien bakteeritaudeista (Pseudomonas marginata McCl., Ps. gummisudans McCl., Bacillus omnivorus Hall ja B. variegatus Rainio nov. spec.).** [Investigations on bacterial diseases of Gladioli (*Pseudomonas marginata* McCl., *Ps. gummisudans* McCl., *Bacillus omnivorus* Hall, and *B. variegatus* Rainio nov. spec.).]—*Valt. Maataloust. Julk.*, 84, 102 pp., 35 figs., 3 graphs, 1936. [German summary.]

Following an introductory survey of the available information on the history and distribution of the bacterial diseases of gladiolus, the writer discusses the occurrence in Finland of *Pseudomonas marginata* [*Bacterium marginatum*: *R.A.M.*, xiv, pp. 173, 498; xv, p. 79], *P.* [*Bact.*] *gummisudans* [ibid., xiii, p. 14], *Bacillus omnivorus* [*B. carotovorus*], revised diagnoses of which are given, and *B. variegatus* n.sp.

Bact. marginatum has been present in the country in a destructive

form for at least 20 years. An inspection of imported corms in 1931 revealed its presence in up to 80 per cent. of the material of certain consignments (average 15 per cent.). *Bact. gummisudans*, first observed in Finland in 1930, is prevalent in gardens in a mild form. In inoculation experiments it attacked the surface of the corms, as well as the leaves, producing rectangular spots. The symptoms induced by *B. carotovorus* on gladioli resemble those caused by the same organism on iris [ibid., xv, p. 99]. Two phases of the rot may be distinguished, the first originating at the time of planting the corms and terminating at the end of June, when infection spreads upwards to the shoots and destroys them, while the second commences at the end of August and involves the hitherto sound portions of the stand. Generally speaking, *B. carotovorus* is not much in evidence in imported consignments, one of which in 1930, however, contained 77 per cent. diseased corms.

B. variegatus n.sp. has evidently been introduced from abroad during recent years, being constantly present in moderate amounts among imported lots of corms. Pale, glistening spots, mostly situated between the scars formed by the dry scales, develop on the corm surface. The tissues underlying the lesions are soft, greyish-yellow, caseous, and permeated by cavities, 1 to 3 mm. in diameter, filled with a greenish-yellow exudate, which reaches the surface through canals ending in small apertures or fissures. The shoots arising from diseased corms grow slowly and the foliage bears a profusion of small, oval, raised, translucent spots, which gradually elongate and turn yellow, imparting a mosaic aspect, while a yellowish bacterial liquid is exuded from their centres. As a rule the infected plants fail to flower.

B. variegatus measures 0·8 to 1·2 by 0·4 to 0·8 μ (average 1 to 1·2 by 0·6 μ) and is motile by peritrichiate flagella, 18 μ in length; it forms on agar spherical, brownish-yellow, sulcate colonies with a metallic sheen; gelatine is slowly liquefied; the minimum, optimum, and maximum temperatures for growth are 3°, 30°, and 34° C., respectively, the thermal death-point 49°, and the minimum, optimum, and maximum P_H values 4·4, 6·2, and 9·4, respectively; the organism is aerobic, succumbs within 1½ hours on exposure to sunlight, produces gas in abundance from glycerine, mannite, dextrose, galactose, and saccharose, forms hydrogen sulphide and indol freely, and reduces methylene blue, sodium selenite, and nitrates.

Inoculation experiments with *B. variegatus* gave positive results on gladiolus. *Bact. marginatum* was strongly pathogenic to the Ariadne, Emile, Eckesachs, and Loreley varieties of *Iris germanica*, *I. spuria*, and *Montbretia* [*Tritonia*] *crocosmifolia* [a hybrid] also being susceptible. *Bact. gummisudans* and *B. variegatus* failed to infect the Iridaceae (other than gladiolus) used in the tests, but *I. germanica*, *I. pallida*, *Hemerocallis fulva*, the above-mentioned hybrid *Tritonia*, chicory [ibid., xiii, p. 492], and *Prunella vulgaris* reacted positively to inoculations with *B. carotovorus*.

Gladioli may be protected against bacterial rot by appropriate cultural measures, including the use of sound planting stock, the selection of sunny sites on acid soil and abundant watering during the growing period, supplemented by the immersion of the corms (freed from their membranous scales) for 30 minutes one day before planting

in a solution of 0·25 to 0·5 per cent. corrosive sublimate, 0·5 per cent. potassium permanganate, or formalin (1 : 200 to 1 : 100), the last-named, however, being liable to retard germination.

GRIEVE (B. J.). **On the occurrence of Bacillus carotovorus Jones causing a soft rot of Iris in Victoria.**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 86–89, 1 pl., 1936.

Iris germanica plants in the University grounds and private gardens at Melbourne have been observed since 1933 to suffer from a soft rot of the rhizome attributed to *Bacillus carotovorus* [see preceding abstract]. Both plants raised from bulbs of German origin and those from indigenous stocks were affected by the characteristic foliar browning and dying-off associated with a caseous consistency of the rhizome, the cut surfaces of which exude a cream-coloured liquid, and a profusion of bacteria in the wood vessels and intercellular spaces of the leaf bases. The causal organism was consistently isolated from the infected leaf bases and reproduced the disease in inoculation experiments. Certain differences between the Melbourne strain and the type *Bacillus carotovorus* (non-liquefaction of gelatine, failure to produce indol, and feeble diastatic action in the former case) are not considered to imply any significant divergence.

ULLSTRUP (A. J.). **Leaf blight of China Aster caused by Rhizoctonia solani.**—*Phytopathology*, xxvi, 10, pp. 981–990, 2 figs., 1 graph, 1936.

In the autumn of 1935 greenhouse China aster (*Callistephus chinensis*) plants at Princeton, New Jersey, were severely attacked by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xii, p. 175], which caused a water-soaked, later alternate light and dark brown, zonate spotting of the leaves and ultimate collapse, beginning with the lowermost and spreading down the petioles to the stem, from which the remainder of the foliage became infected. Heavily blighted leaves were frequently traversed by scattered strands of coarse mycelium. Under favourable conditions for the development of the fungus, the plants were often killed within a few days.

The culture of *C. solani* (A1) isolated from diseased aster leaves was compared with four others, viz., P 1 from potato (New Jersey), and SB 1, 2, and 3 from sugar beet [ibid., xvi, p. 150], the first two from Minnesota and the third from Michigan. The A 1 strain made no growth on potato dextrose agar at 5° C., very little at 10°, the optimum development between 25° and 30°, and an appreciable growth at 35° [ibid., xvi, p. 122]; SB 3 grew better than A 1 at the lower temperatures and also made some growth at 35° C., P 1 developed better at the lower range, declining above 25°, while SB 1 and 2 were intermediate in their temperature relationships between the potato strain and A 1.

In cross-inoculation experiments on aster, beet, and potato, A 1 was unquestionably the most virulent, SB 1, 2, and 3 produced moderate or severe infection, while P 1 was non-pathogenic under the conditions of the tests. In further inoculations on aster, beet, and *Begonia semperflorens* leaves, strains A 1 and SB 3 produced infection cushions on the

host surface which directly penetrate the cuticle. In the case of SB 1 and 2 penetration was effected only through the stomata without the intervention of infection cushions.

HARRAR (J. G.). **Cercospora leaf spot of Calendula in Virginia.**—*Plant Dis. Reptr*, xx, 17, pp. 277–278, 1936. [Mimeographed.]

Since 1933 species of *Calendula* in Virginia have been increasingly affected by a leaf spot due to *Cercospora calendulae* Sacc. The lesions sometimes coalesce into a large necrotic area, and the whole plant may become blighted. Once established the disease is liable to affect the entire planting, though seedlings under four weeks old are not attacked. The fungus is air- and soil-borne, but is not normally transmitted by the seed. Control is readily attained by the use of Bordeaux mixture, lime-sulphur, copper oxide, or sulphur dust.

WHITE (H. L.). **On Verticillium wilt of the perpetual-flowering Carnation.**—*J. Pomol.*, xiv, 3, pp. 216–226, 1936.

In further studies on carnation wilt (*Verticillium cinerescens*) [a preliminary account of which has already been noticed: *R.A.M.*, xv, p. 654] more than 80 per cent. of the isolations from 10 plants, using woody tissue taken not less than 3 ft. above the main limbs, yielded the causal fungus only. Isolations from the region of the collar commonly yielded *Fusarium culmorum* [loc. cit.].

From one nursery 15 plants showing stem rot each yielded *Fusarium dianthi* [loc. cit.], mostly free from other organisms though *F. culmorum* was common. When comparative inoculations were made with *V. cinerescens*, *F. culmorum*, and *F. dianthi*, the first caused a rapid wilt, characterized by rotting of all the stem tissues, while the second and third induced a slower wilt, associated with extensive vascular infection. All three were readily reisolated some distance away from the site of inoculation. Plants infected by *V. cinerescens* are not usually stunted, and the extensive vascular browning present is not associated with cortex and pith lesions; the plants show longitudinal zonation of the diseased woody tissues with gradual merging of the diseased and healthy wood, and the dried stems are firm to the touch. Plants infected by *F. dianthi* show distortion and stunting of the young shoots together with extensive vascular lesions with a shredded, silvery appearance. The dried stems tend to yield to pressure as if they are hollow. Longitudinal zonation of the diseased woody tissues is present, with sharp demarcation between the healthy and diseased wood. *F. culmorum* causes wilting of the shoots as a whole, with generalized rotting of the pith, cortex, and wood.

In discussing possible means of control the author suggests steam sterilization of the soil, supervision of the water-supply, and avoidance of the transfer of contaminated soil on tools and hoses. The growing of a generation in pots for propagation exclusively might be undertaken for the purpose of cleaning stock, variety by variety, and should be an essential precaution in the propagation of stock from new varieties from other nurseries, which should be confined for this purpose to a quarantine house.

Brown (A. M.). **Studies on the interfertility of four strains of Puccinia helianthi Schw.**—*Canad. J. Res.*, xiv, 10, pp. 361–367, 1 pl., 1936.

In a study on the crossing behaviour of *Puccinia helianthi* [*R.A.M.*, xv, p. 421] inoculation experiments on 6 species of *Helianthus* showed that 4 distinct strains of the fungus were present on *H. annuus*, *H. petiolaris*, *H. tuberosus*, and *H. subtuberosus*, respectively. The strain from *H. annuus* produced the same types of infection on *H. annuus*, *H. tuberosus*, and *H. maximiliani*, and is probably identical with Bailey's race (form) 1 [ibid., iii, p. 401].

All possible combinations of reciprocal crosses, either by transference of pycnidial nectar or by the diploidization of haploid pustules with uredospore (diploid) mycelium were made among the four strains, which on a basis of their infertility fell into two groups, the first (A) consisting of the strains on *H. annuus* and *H. petiolaris*, and the second (B) of those on *H. tuberosus* and *H. subtuberosus*. The two strains of each group were highly interfertile, though the strains of one group were highly intersterile with those of the other. The similarity of the crossing behaviour of the two groups to that of certain varieties of *P. graminis* suggests that each group of *P. helianthi* represents a variety.

Remsberg (Ruth) & Hungerford (C. W.). **Black stem of Alfalfa in Idaho.**—*Phytopathology*, xxvi, 10, pp. 1015–1020, 1 fig., 1936.

The 'black stem' disease of lucerne in Idaho [*R.A.M.*, xvi, p. 22] appears to be identical with that reported under the same name from Kentucky, the causal organism in both cases being *Phoma medicaginis*. Grown on sweet clover [*Melilotus alba*] stems, the fungus produced an ascigerous stage corresponding to *Pleospora rehmiana*, which was also found on old lucerne stems in the field. Ascospore isolations from the cultural perithecia and from natural material produced the imperfect stage of the fungus, and greenhouse inoculations with *P. rehmiana* on Common and Grimm lucerne and yellow-blossom *M. alba* resulted in the development of typical black stem lesions, from which *Phoma medicaginis* was reisolated. It is apparent from these data that *Pleospora rehmiana* is the perfect stage of *Phoma medicaginis*; the ascospores of the fungus evidently serve as inoculum in the field during the spring, when the perithecia were observed to be present on overwintered tissue.

Rainio (A. J.). **Über die Dilophospora-Krankheit von Phleum pratense L. und Alopecurus pratensis L.** [On the *Dilophospora* disease of *Phleum pratense* L. and *Alopecurus pratensis* L.]—*Valt. Maatalousk. Julk.*, 87, 32 pp., 8 figs., 1936. [Finnish summary.]

Dilophospora alopecuri is commonly found in Finland forming on *Phleum pratense*, *Alopecurus pratensis*, and wheat [*R.A.M.*, xiv, p. 296] leaves and leaf sheaths small, circular, light brown or reddish spots (the centres later turning white) containing an endophytic mycelium which gives rise to the first conidial stage of the fungus, known as *Mastigosporium album* [ibid., xvi, p. 31]. Close examination of the epiphytic mycelium covering the leaves and ears of infected wheat showed here and there filiform conidia, 35 by 2·5 μ in diameter, compared with the usual spindle shaped ones, 54 by 12 μ, but provided with

the characteristic appendages. When conidia of the latter type are placed on artificial nutrient media they produce the filiform conidia, and after a month pycnidia of *D. alopecuri*. An abundance of nitrogen in the substratum promoted the development of *M. album*, while the presence of carbohydrates favoured the growth of the *D. alopecuri* stage.

The conidia lost their viability in about four months at laboratory temperature while that of the pycnospores was retained for two years. The latter organs are well able to withstand the winter temperatures prevailing in Finland. The aerial mycelium can survive a temperature of −10° C. whereas one of −3° kills the conidia. The pycnospores overwintering on the surface of the seed, however, are incapable of infecting the plants owing to the slow germination of the spores and consequent failure of the hyphae to penetrate the growing-point at the critical stage. Infection takes place by means of the mycelium hibernating in the interior of the seed and penetrating the germinating embryo. Air currents and insects (mainly the former) convey the conidia from the surface of the ground or from diseased plant organs to the young leaves and ears, where germination and subsequent infection occurs, usually during the flowering period.

Positive results were given by inoculation experiments with pure cultures (oatmeal agar) of the fungus from *P. pratense* on wheat, spelt, barley, oats, rye, *Setaria italica*, *S. viridis*, *Dactylis glomerata*, *Festuca pratensis*, *Hordeum murinum*, *Lolium perenne*, *L. temulentum*, *Panicum crus-galli*, *Triticum* [*Agropyron*] *repens*, and a number of other grasses.

KIDD (F.) & WEST (C.). **Gas storage of fruit. IV. Cox's Orange Pippin Apples.**—*J. Pomol.*, xiv, 3, pp. 276–294, 2 pl., 1 graph, 1936.

In gas storage experiments conducted from 1931 to 1934 at the Ditton Laboratory with Cox's Orange Pippin apples [*R.A.M.*, xiii, p. 35], low temperature breakdown [ibid., xv, p. 301] occurred only at 34° F., severity increasing with rising concentrations of carbon dioxide in the storage atmosphere and increased duration of storage.

No brown heart [ibid., xv, p. 300] developed in the fruit stored in air. In the presence of 5 per cent. carbon dioxide the disease developed only at 50°, and in the first season (1931–2) only. In mixtures containing 10 per cent. carbon dioxide there was considerable brown heart in the first season at 34° and 50°, but practically none at 39°, whereas in the second season (1932–3) only a trace was present at any of these temperatures. With 15 per cent. carbon dioxide, brown heart was severe in both seasons. The disease may therefore be regarded as an effect of exposure to carbon dioxide. The fruit becomes affected early in its storage life, and with the variety tested the risk of injury rules out the use of carbon dioxide concentrations exceeding 5 per cent. at 34° or 10 per cent. at 39°, while at 50° there is danger even with 5 per cent. of the gas.

The type of flesh browning confined to the core region, 'core flush' [ibid., xiii, p. 108], increased with increasing concentration of oxygen; carbon dioxide did not appear to play any important part in its causation. Two seasons' results showed that an atmosphere containing 2·5

per cent. oxygen and 5 per cent. carbon dioxide at 34° or 39° was completely satisfactory as regards this condition.

The occurrence of fungal wastage was extremely erratic, little obvious relationship being found between it and the atmospheric conditions tested.

Within the limits of the experiments the maximum storage life of Cox's Orange Pippin apples was obtained at 39° in an atmosphere containing 2·5 per cent. oxygen and 5 per cent. carbon dioxide.

Askew (H. O.), Chittenden (E.), & Thomson (R. H. K.). **The use of borax in the control of 'internal cork' of Apples.**—*J. Pomol.*, xiv, 3, pp. 227–245, 3 graphs, 1936.

In this paper [parts II and III of which are by the first two authors only] describing further investigations in New Zealand into the connexion between apple internal cork and boron deficiency [*R.A.M.*, xiv, p. 770; xv, p. 446] it is stated that observations of the penetration of borax used as a top-dressing in typical orchard areas on several soil-types showed it to be relatively rapid. Laboratory experiments in which soil was shaken with borax solutions demonstrated that some fixation of boron occurs, the amount varying considerably in different soils, so that the rate of penetration also varies.

Detailed studies throughout the growing season showed that the boron content of Jonathan apples growing in a severely affected orchard at Braeburn decreased steadily from relatively high values (33·0 p.p.m.) for the young fruits to relatively low ones (8·9) for fruits at the export picking stage, whereas in a part of the orchard treated with 100 lb. borax per acre the content fell from 21·5 to 17·5 p.p.m. In a healthy orchard at Stoke the corresponding figures were 29·2 and 13·5 p.p.m. In another badly diseased orchard of Dougherty apples at Umukuri the boron content of the untreated fruit fell from 9·4 to 4·1 p.p.m. compared with 17·3 and 15·2 p.p.m. for the portion treated with ½ lb. borax per tree, and with 43·9 and 17·6 p.p.m. for Dougherty apples from a healthy area at Stoke.

Further data from six apple varieties in six orchards showed that the use of borax markedly increased the boron content of the leaves and fruit, and even when the boron content reached 30·6 p.p.m. no toxic effects resulted. The evidence indicated that the trees meet the boron requirements of the leaves first; when boron is deficient, the content in the fruits falls long before any appreciable decline occurs in the leaves. Borax applications did not improve the vegetative condition of the trees, but in all cases they practically eliminated internal cork. The rate of intake of boron in the average Jonathan and Dougherty apples increased parallel with the size of the fruits until the end of the experiment, when it slowed down. On the untreated areas the rate of intake fell to nearly zero towards the end of the period.

The data obtained showed that the normal annual requirement of an apple orchard for leaf and fruit growth is only approximately 14 oz. borax per acre. The use of ½ to 1 lb. hydrated borax per tree, or 50 to 100 lb. per acre, broadcast, is safe and gives satisfactory control of internal cork.

Spraying with 0·1, 0·5, and 1 per cent. borax solutions controlled the

disturbance. As boron absorption depends on retention on the leaves, two sprays of 0·25 per cent. borax applied during November at an interval of 20 days are recommended for commercial practice. Preliminary trials did not indicate that any objectionable results follow the introduction of the borax into the lime-sulphur sprays used at this period of the year.

The treatment of Jonathan and Delicious trees in full leaf in a badly affected orchard by injections of 2·5 or 5 gm. hydrated borax in the form of 0·25 per cent. solution gave complete control of internal cork in all cases, whilst the untreated Jonathan trees showed 94·22 per cent. fruit with internal cork and Delicious 9·0 per cent. Single trees of each variety injected in one limb with 5 gm. borax yielded no fruit with internal cork on the injected limbs, as against 4 and 7 per cent. on the other branches of the Jonathan and Delicious trees, respectively. A measurable amount of boron was found to have migrated to the untreated branches.

[This paper is also published in *N. Z. J. Sci. Tech.*, xviii, 4, pp. 365–380, 3 graphs, 1936.]

Codlin moth and black spot. Control measures for Apples and Pears.—*Fruit World, Melbourne*, xxxvii, 9, p. 5, 1936.

The spray programmes recommended by the Victorian Department of Agriculture for the control of codlin moth [*Cydia pomonella*] and black spot [scab: *Venturia inaequalis*] on apples are: schedule 1, at the green tip stage, Bordeaux mixture 6–4–40, early pink stage 3–3–50, followed by 6 or 7 lead arsenate plus Bordeaux (6 oz.–6 oz.–80) plus lime casein ($\frac{1}{2}$ to 1 lb. per 80 galls.) sprays; schedules 2 and 3 (for use on varieties liable to russet) are the same, but in place of the early pink application lime-sulphur is applied at the blossom stage, petal fall, and again fourteen days later in addition to arsenate sprays. Against pear scab [*V. pirina*: *R.A.M.*, xvi, p. 47] and codlin moth the usual Bordeaux schedule is followed by application of lead arsenate. On the Josephine variety only one Bordeaux spray 6–4–40 should be given, at the green tip stage. With Winter Nelis the second Bordeaux spray must be applied before any petals show pink.

Schmidt (M.). **Venturia inaequalis (Cooke) Aderhold. VI. Zur Frage nach dem Vorkommen physiologisch spezialisierter Rassen beim Erreger des Apfelschorfes. Erste Mitteilung.** [*Venturia inaequalis* (Cooke) Aderhold. VI. First note on the question of the occurrence of physiologically specialized strains in the agent of Apple scab.]—*Gartenbauwiss.*, x, 4, pp. 478–499, 1 fig., 1 diag., 1936.

A tabulated account is given of cross-inoculation experiments on apple varieties and *Malus* [*Pyrus*] spp. with monospore cultures of *Venturia inaequalis*, the results of which confirmed the conclusion drawn from previous tests [*R.A.M.*, xvi, p. 45] as to the liability of a given host to infection by a large number of distinct strains. Each of 14 apple varieties (comprising a test assortment) was inoculated with monospore cultures from all the representatives of the group, with the result that, in most cases, a given strain proved pathogenic to some of the hosts and not to others. None of the strains agreed in their pathogenicity towards

the same hosts, so that the test assortment furnishes a means of characterizing the specific degree of virulence of the various fungal types. The results of trials with material from different parts of Germany and from Wädenswil (Switzerland) conformed in general with those obtained with the corresponding local Müncheberg strains. Morphologically distinct cultures from a tree of the same variety showed differences in pathogenicity towards certain hosts.

Ernst Bosch and a form of Antonovka were the only two varieties showing resistance to a relatively high proportion of the strains used in the tests, all of which were able, on the other hand, to infect Landsberg Pippin, while Winter Golden Pearmain was attacked by the majority. Among the species of *Pyrus* reacting positively to inoculation with cultures of *V. inaequalis* from cultivated apples were *M.* [*P. pulcherrima* var.] *arnoldiana*, *M.* [*P.*] *baccata*, *M. cerasifera* [*P. divaricata*], *M.* [*P.*] *ioensis plena*, *M.* [*P.*] *prunifolia*, and the Hislop crab-apple; *M.* [*P.*] *spectabilis* was virtually immune from infection from any of the test sources and has so far remained free from attack in the field at Müncheberg. Winter Golden Pearmain, Antonovka, and Landsberg Pippin contracted infection as a result of inoculation with cultures of *V. inaequalis* from several species of *Pyrus*, while Ernst Bosch again showed a marked degree of resistance. The weak reaction of certain apple varieties and *P.* spp. to the strains of scab used in these experiments was expressed by the development of chlorotic lesions, often having a brown necrotic centre but bearing few or no conidia.

The outcome of these trials is interpreted as demonstrating the existence of physiologic specialization in *V. inaequalis*.

Loewel (E. L.). **Die Apfelblüte als Spritztermin.** [The Apple blossom as spraying indicator.]—*Gartenbauwiss.*, x, 2, pp. 232–246, 4 figs., 1936.

The results [which are fully discussed and tabulated] of experiments conducted in 1934–5 in the control of apple scab (*Fusicladium*) [*Venturia inaequalis*] by the standard methods in use in the Altenland district of Germany [*R.A.M.*, xiv, p. 517] clearly demonstrated the superior efficacy of the treatments applied during blossoming to those given earlier or later, the most propitious moment apparently being when the central flower of a cluster is fully expanded. None of the varieties included in the tests (Beauty of Boskoop, Boiken, Signe Tillisch, Schur, Bell, and others) sustained any damage from the treatments, and the only problem remaining to be solved in this connexion is their possible deleterious influence on bees [see next abstract]. Until this urgent question is finally settled growers should not spray while the trees are actually in flower.

Loewel (E. L.) & Lüttgau (W.). **Obstbaumspritzung und Bienensterben im Altländer Obstbaugebiet.** [Fruit tree-spraying and bee mortality in the Altland orchard region.]—*Gartenbauwiss.*, x, 4, pp. 521–536, 1 fig., 1 graph, 1936.

Daily counts of the mortality figures in beehives situated in north German orchards, where spraying against *Fusicladium* on apple, pear, and cherry [*Venturia inaequalis*, *V. pirina*, and *V. cerasi*] is regularly

practised, showed sharp rises following applications (particularly the third and fourth post-blossom) of lime-sulphur and copper-containing preparations, with or without the admixture of arsenic [see preceding abstract]. Similar results attended the feeding of the bees with these mixtures under controlled conditions. No injury was caused by a combination of 2 per cent. lime-sulphur and 0·2 per cent. alvesco or by the latter alone, but adequate control of the above-mentioned diseases cannot be secured by these methods. In view of the heavy losses sustained both by fruit-growers and beekeepers under the existing conditions (the former being liable to heavy claims for damages), it is essential to devise a spraying schedule combining toxicity to the scab pathogens with absolute harmlessness to bees.

Jamalainen (E. A.). **Omenapuiden lehtien ja hedelmien ruiskutusvioituksista.** [Spraying injuries to Apple leaves and fruits.]—*Valt. Maatalousk. Julk.*, 83, 35 pp., 12 figs., 2 diags., 1936. [German summary.]

Considerable damage is stated to be inflicted on the leaves and fruits of apples in Finland by Bordeaux mixture, lime-sulphur, and arsenical preparations used in spraying operations [*R.A.M.*, xv, p. 727]. The injuries thus induced may assume various forms, including a dark purplish, red, or dark brown spotting of the leaves, foliar chlorosis (yellow leaf) [ibid., xii, p. 29], shrivelling and distortion of the foliage, and black lesions on the fruit, sometimes penetrating the flesh and in severe cases causing premature dropping. Of the preparations tested an acid Bordeaux mixture (10 gm.–5 gm.–1 l.) caused the most serious damage, the effects of which were noticeable two to four days after application. The White Nalif variety proved to be highly susceptible to spray injury, even the ordinarily less deleterious lime-sulphur-lead arsenate mixture impairing the quality of the fruits. Other varieties very liable to Bordeaux injury include Autumn Redstreak, Astrachan, and Antonovka; these should be treated exclusively with lime-sulphur. The latter preparation being comparatively ineffectual, however, against *Fusicladium* [*Venturia inaequalis*: see preceding abstracts], Bordeaux mixture should be applied to all scab-susceptible varieties that can tolerate it at concentrations of 1 per cent. before and 0·5 per cent. after blossoming.

Baker (K. F.) & Heald (F. D.). **The effect of certain cultural and handling practices on the resistance of Apples to Penicillium expansum.**—*Phytopathology*, xxvi, 10, pp. 932–948, 1936.

The rate of advance of blue mould (*Penicillium expansum*) decay in Delicious and Winesap apples [*R.A.M.*, xvi, p. 43] in Washington was found to be slightly more rapid in fruit from trees in fertilized plots than in the untreated controls, and in apples picked at prime as compared with those gathered at early maturity. The duration of storage did not influence the rate of decay until after 180 days, when it materially increased. The number of lenticel infections by *P. expansum* per apple was higher in fruit picked at prime than at early maturity. The incidence of such infections was unaffected by the application of orchard fertilizers and by the length of the storage period up to 180

days, after which a slight increase was sometimes shown. The Winesap variety was more resistant than Delicious to lenticel infection by *P. expansum* and to the radial advance of the fungus in the tissues. A detailed consideration of methods for the prevention of blue mould decay under local conditions has been presented elsewhere [ibid., xiii, p. 781].

Hamilton (J. M.). **Cedar rust and its control in the Hudson Valley.**—*Proc. N.Y. St. Hort. Soc.*, lxxxi, pp. 216–221, 1936.

A semi-popular account is given of the symptoms and life-history of the cedar rusts (*Gymnosporangium juniperi-virginianae* [*R.A.M.*, xvi, pp. 21, 75], *G. globosum* [ibid., xv, p. 512], and *G. clavipes* [ibid., xv, p. 159]), the increasing prevalence of which in apple orchards is a cause of serious concern to Hudson Valley growers. The incubation period of *G. juniperi-virginianae* on the apple ranges from 6 to 14 days, and a further 72 days must elapse before spores are produced on the fruit to reinfect the cedars [*Juniperus virginiana*], two years on which are then necessary for the maturation of the galls and the liberation of spores to attack the apple. Spore discharge from the galls takes place during the warm rains of early May at a minimum temperature range of 50° to 60° F. For the effective control of cedar rusts it is necessary to spray at 7- to 10-day intervals, the most promising of the materials so far tested being flotation sulphur paste (Camden) and kolofog with a bentonite [ibid., xv, p. 594] sticker. Should these measures prove impracticable, the disease may be controlled for commercial purposes by the complete eradication of cedars from a radius of half a mile round the apple orchard, though complete elimination of infection cannot be guaranteed by this method, since the spores may be carried for several miles by the wind under favourable weather conditions.

Lopatin (M. I.). Монилиальный ожог Яблонь—**Sclerotinia fructigena Schröt.** [Blossom blight of Apples caused by *Sclerotinia fructigena* Schröt.]—*Pl. Prot. Leningr., 1936*, 10, pp. 103–107, 1936. [English summary.]

An account is given of a severe outbreak in the wet and warm spring of 1933, of blossom blight on Saffron Pippin apple trees in Uman [province of Kieff], attributed to *Sclerotinia fructigena* [*R.A.M.*, xv, p. 531; but the conidial pustules of which are stated to be greyish-white]. In its symptoms [which are described in detail] the disease is very similar to that caused by *S.* [illegible] *a* [*S. laxa*, ibid., xi, p. 58; xiv, p. 704] on stone fruits, but differs in that necrosis of the floral organs usually becomes apparent only after the setting of the fruit. From the dead blossoms, which remain attached for a long time, the fungus gains the twigs, many of which are killed, with consequent defoliation of the trees. In 1933 the outbreak resulted in almost complete loss of crop from the attacked trees, and in 1934 the twigs of the latter were found to bear numerous cankers around the dead fruit spurs of the preceding season. The blossom blight again recurred very severely in the spring of 1935, when infection occurred also on Landsberg Pippin apple trees.

Riker (A. J.). **Recent developments in control of graft knots on nursery Apple trees.**—*J. econ. Ent.*, xxix, 5, pp. 956–960, 5 figs., 1936.

Complete commercial control of graft knots on nursery apples, associated with (*a*) excess callus caused by a wound developing into a wound overgrowth, (*b*) crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*), and (*c*) hairy root (*P.* [*Bact.*] *rhizogenes*) [*R.A.M.*, xv, p. 774], is stated to have been obtained in the middle-western United States by the following precautions: (1) removal of bacteria on the surface of seedling grafts by washing off the soil and then dipping for one minute in mercuric chloride 1 in 1,000; (2) preparation of well-fitted grafts from clean roots with a dry surface to reduce the spread of bacteria over the cut; (3) use of nurseryman's adhesive tape wrappers [ibid., xiv, p. 452] which prevented excess callus and protected the grafts from insect attack but decayed before girdling the growing tree; and (4) selection of relatively insect-free sites for planting.

Ferraris (T.). **Seccume fogliare estivo del Pero.** [Summer withering of Pear leaves.]—*Riv. agric., Roma*, xxxii, 740, p. 287, 1936.

In 1936, pears in Italy became very severely infected by white leaf spot (*Sphaerella* [*Mycosphaerella*] *sentina*) [*R.A.M.*, xv, p. 103]. The disease broke out at the end of June, and by the middle of August some of the trees were completely defoliated. High resistance was shown by the Trionfo di Jodoigne variety and to a less extent by Curato, Pentecoste, Bergamotta Esperen, Martina, Cannellino, and Madernassa, while Verde Londra, Beurrè d'estate and Duchesse Williams pears were more susceptible. Control consists in treatment during the first fortnight in June and again about the middle of August with 1 per cent. Bordeaux mixture, Caffaro powder, or the new copper fungicide cuprital (Casa Scida, Torino). All fallen leaves should be burnt. Winter treatments with cupric sprays or polysulphides are also advantageous.

Wollenweber (H. W.) & Hochapfel (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. II. Monochaetia und Pestalotia und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. II. *Monochaetia* and *Pestalotia*, and their relationship to fruit-rotting.]—*Z. PflKrankh.*, xlvi, 9, pp. 401–411, 7 figs., 1936.

In continuation of this series of studies [*R.A.M.*, xvi, p. 105], the authors give brief descriptions of the following fungi, with annotations: *Monochaetia desmazierii*, *Pestalotia* [*Pestalozzia*] *truncata* Lev., *P. sydowiana* Bres., *P. palmarum* [ibid., xiv, p. 608; xv, p. 15], *P. cruenta* Syd., *P. disseminata* Thümen, and *P. theobromae* Petch, all of which were isolated by them from home-grown or imported plant hosts. It was experimentally shown that, except *M. desmazierii*, all the fungi studied were capable of causing a comparatively slow rotting of apples, which completely involved the whole fruit in periods from $1\frac{1}{2}$ to 3 months at room temperatures.

Gaddis (B. M.). **Eradication of Citrus canker and control of phony Peach and Peach mosaic : progress report.**—*J. econ. Ent.*, xxix, 5, pp. 940–944, 1936.

Citrus canker [*Pseudomonas citri*: *R.A.M.*, xv, p. 832] is stated to have been found during the last 18 months in non-commercial citrus areas in three Louisiana parishes and four Texas counties. Since August, 1935, relief labourers have eradicated over 1,500,000 trees, including all citrus, on more than 98 per cent. of the affected properties throughout the area under observation.

By means of intensive measures in the south-eastern States, the number of phony peaches [ibid., xv, p. 832] in the worst situations has been reduced from 177 per thousand in 1929 to less than 20 per thousand during the last two seasons. During 1936 over 2,000,000 abandoned and 3,500,000 escaped peach trees have been eradicated in 129 counties of 11 States by a force of 2,000 men employed under the Emergency Relief project, which has allotted $840,000 for the purpose.

Peach mosaic [ibid., xv, p. 816] has spread with extreme rapidity in Mesa County, Colorado; in 1934 E. W. Bodine counted about 3,000 diseased trees in the Palisade area, from which in 1935 some 30,000 were removed. In one orchard the number of infected trees increased from 2 in 1929 to all but 13 out of over 1,200 in 1935.

Newton (W.). **The menace of Cherry mosaic.**—*Bett. Fruit*, xxxi, 3, pp. 7, 14, 2 figs., 1936.

In the autumn of 1935, buds from a Royal Ann cherry tree growing in an experimental orchard on Vancouver Island and affected with mosaic [cf. *R.A.M.*, xv, pp. 480, 664] were transferred to a healthy cherry seedling in a neighbouring orchard. The following spring, every branch in which a bud had been inserted was diseased. There was a conspicuous loss of flavour in the fruit, which contained about 2 per cent. less sugar than normal cherries. In experiments in 1936 healthy trees inoculated by budding showed mottling of the leaves on the tips of the branches (the first symptoms to appear) within one month, even when the buds were inserted near the trunk. When the juice from mottled leaves was rubbed on healthy ones characteristic mottling appeared on the latter and on adjacent leaves within one month. Infection spread rapidly within trees artificially inoculated at a single point. Sufficient sap can adhere to pruning shears to transfer the disease from tree to tree, and when the disease is present implements should be sterilized after use on every tree.

Zeller (S. M.). **Verticillium wilt on cane fruits.**—*Bull. Ore. agric. Exp. Sta.* 344, 25 pp., 5 figs., 1 graph, 1936.

In western Oregon wilt (*Verticillium albo-atrum*) [*R.A.M.*, viii, pp. 357, 732; x, p. 757] has been the primary factor responsible for the decline in the growing of black raspberries (*Rubus occidentalis*), and is the chief factor limiting the yields of this host to about one-third of what it is assumed they should be. In severe outbreaks, 50 per cent. of the plants or more have been infected. Infection usually occurs through the small roots, and is carried, among other hosts, by eggplant,

pigweed (*Amaranthus* sp.), groundsel (*Senecio vulgaris*), maples [*Acer* spp.], and barberry.

Inoculation experiments were made on plantings of Cumberland, Munger, and Plum Farmer black raspberry varieties, with strains isolated from black raspberries and potatoes. Inoculation was effected at planting time by placing cultures in contact with the roots. Of the 1,877 plants inoculated, 1,624 or 86·5 per cent. became infected (as determined by cultures from discoloured wood), and of these 55·1, 31·1, 12·4, and 1·4 per cent. were infected in the first, second, third, and fourth years, respectively. Out of 262 uninoculated controls 137 or 52·3 per cent. became diseased, but infection was much delayed and two-thirds of it occurred in the third year. Of the infected plants 1·8 per cent. recovered. There were 37·3 per cent. of the inoculated plants and 10·3 per cent. of the controls killed by the disease. Out of a possible 723 plants only 274, or 37·9 per cent., attained four years of age. Of the inoculated plants 64·3 and 60·2 per cent. were infected by the fungus from black raspberry and potato, respectively.

Low temperatures and continuous cold weather seemed to increase mortality due to infection, infected plants apparently being more susceptible to winter injury than normal ones. A correlation appears to exist between the death of infected plants and temperatures below 20° F. With temperatures of under 10° marked increase occurred both in infections and deaths.

When the canes were planted 30 in. apart, 8·3 per cent. of the plants as far away as fourth from the inoculated plants became diseased in the third year. In the second year, 6·7 per cent. were infected at distances of 9 ft. with no intervening plants.

The Cuthbert variety of red raspberry was highly resistant, as were the blackberry varieties Evergreen (*R. laciniatus*), Himalaya, Lawton, and North-Western Trailing (*R. macropetalus*). Asiatic *Rubus* hybrids of the *Coreanus*, *Lasiostylus*, and *Triflorus* types, though infected, maintained extraordinary vigour and showed remarkable resistance. Considerable infection was observed in the red raspberry varieties Ranere, Chief, Herbert, Red Antwerp, Latham, Sunbeam, and Lloyd George.

In tests on viability the fungus lived over on raspberry canes in the soil from one autumn to the next (October, 1927, until October, 1928) but did not live much longer (after 25th February, 1929).

For purposes of control it is suggested that infected plants should be rogued provided that the incidence of the disease is under 5 per cent. Three- or four-year rotations with two or three non-susceptible crops also proved experimentally effective in eliminating the fungus from the soil and is recommended together with the use of planting stock from healthy nurseries.

Cooley (L. M.). **Retarded foliation in black Raspberries and its relation to mosaic.**—*Bull. N.Y. St. agric. Exp. Sta.* 675, 20 pp., 4 figs., 1936.

Four years' observations in western New York demonstrated that black raspberry plants [*Rubus occidentalis*] affected with green mottle mosaic [*R.A.M.*, xv, p. 377] show retarded foliage development on the

fruiting canes in spring. From 74 to 94 (average 85) per cent. diseased plants were detected by this symptom. In 1933 only 0·4 per cent. of the virus-free plants showed delayed foliation, but in 1934 winter injury considerably retarded development and accounted for the inclusion of 16 per cent. of virus-free plants in the retarded foliation class. In 1935 winter injury was again frequent but careful diagnosis of individual cases reduced the proportion of virus-free plants included in the retarded foliation group to 1·2 per cent. Retarded foliation was present in a higher proportion of the severe infections than of the medium ones, and in more of the latter than in mild cases. Inspections were more easily made and more reliable on susceptible varieties (e.g., Plum Farmer) than on resistant ones (e.g., Cumberland). The retarded foliation character is recommended as a basis for an auxiliary roguing early in the spring except in seasons where winter injury is abundant. On an average only 25 per cent. of black raspberries affected by yellow mosaic showed delayed foliation and neither virus affected red raspberries in this manner.

Cooley (L. M.). **Wild Brambles in relation to spread of virus diseases in cultivated black Raspberries.**—*Bull. N.Y. St. agric. Exp. Sta.* 665, 15 pp., 4 figs., 1936.

Five years' field studies in large experimental black raspberry (*Rubus occidentalis*) plantations in western New York demonstrated that wild red raspberries (*R. idaeus*, principally var. *strigosus*), which are widely present, are usually infected with either green or yellow mosaic or both [see preceding abstract], though without marked symptoms, and support steady populations of the principal vector, *Amphorophora rubi*. Control by inspection and roguing was impossible without the eradication of the wild red raspberries in the vicinity of the experimental plots. In one instance, mosaic spread in significant quantity from wild red raspberries into a field 1,235 ft. away. Wild blackberries (mostly *R. allegheniensis*) and black raspberries (*R. occidentalis*) were rarely infected by mosaic and appeared to play no part in spread. In any mosaic control project in New York all wild red raspberries within 1,000 ft. of every planting should be eradicated.

Leaf curl [*R.A.M.*, x, pp. 195, 530; xv, p. 376] was rarely present on wild brambles, and was found in only four instances on red and black raspberries. The vector, *Aphis rubicola*, is common on all wild raspberries locally, and though spread of the disease from wild hosts to the experimental plantings was very slow, it took place as readily from distant as from closely adjacent sources. All affected wild raspberries should be removed from the vicinity of healthy plantings.

Wild blackberries and black raspberries were occasionally found to be affected by streak [ibid., xv, p. 163]. Spread from these usually appeared to be unimportant, but in one instance the presence of wild blackberries in the vicinity seemed to accelerate greatly the spread of the disease in black raspberries. It is thought probable that the blackberries harboured the unknown vector of streak disease. Any wild blackberries near black raspberry plantings containing severe streak infections should therefore be eradicated.

Cooley (L. M.). **Wild Bramble eradication.**—*Bull. N.Y. St. agric. Exp. Sta.* 674, 31 pp., 9 figs., 1936.

Notes are given on the eradication of wild *Rubus* spp. against virus diseases [see preceding abstract] by mowing, burning, grubbing, clean cultivation, live-stock grazing, and certain chemicals. Among the more effective eradicants were ammonium sulphocyanate, sodium chlorate, and sodium arsenite, and recommendations, based on experimental data, are made as to their correct application.

Hoette (Shirley). **Pitting disease of Bananas in Australia.**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 90–95, 1 pl., 1 fig., 1936.

From Queensland bananas affected by pitting disease the writer isolated a fungus corresponding in the main with *Piricularia grisea*, the agent of the same disorder in Brazil and Trinidad [*R.A.M.*, xiii, p. 455], although the conidial dimensions of the Australian fungus (17 to 34 by 6 to 10 μ, average 23 by 8 μ) fall between those recorded by Saccardo (18 by 9 μ) and Wardlaw and McGuire (24 to 29 by 10 to 12 μ). Infection occurs during the colder months and may first be recognized by the development of pin-point brown spots, each surrounded by a narrow, water-soaked area, scattered over the entire concave surface of the finger and over the stalk of the green fruit, and expanding to a diameter of 2 to 4 mm. Under Queensland conditions *P. grisea* develops in the plantation before picking, whereas in Brazil and Trinidad the lesions do not begin to develop until the fruit is placed in cold storage. The disease is probably perpetuated by the washing down of the conidia by rain from the 'transition' leaves and bracts on to the fruit.

Smart (H. P.). **Sigatoka leaf disease of Bananas (Cercospora leaf-spot).**—*Leafl. Dep. Agric. B. Honduras*, 3, 7 pp., [1936].

A popular account is given of the banana leaf-spot (*Cercospora musae*) [see above, p. 156], with special reference to conditions in British Honduras, where infection has appeared in the Toledo District. Immediate action is being taken to apply control measures, but large-scale operations are regarded as impracticable as most of the plantations are small and scattered, and the planters have insufficient capital for the purchase of the power spraying or dusting appliances required. Hand spraying, however, is recommended, as giving some control, if infection is not too severe. In light outbreaks pruning off infected leaves and spraying the surrounding plants are advised; in bad but localized outbreaks all plants should be cut down over an area five times the extent of the infected zone.

Parham (B. E. V.). **Banana disease investigations—annual report, 1935.**—*Annu. Bull. Dep. Agric. Fiji*, pp. 28–31, 1936.

Bunchy top was found to be responsible for the destruction of some 10 per cent. of all banana plantings [*R.A.M.*, xiv, p. 45]. Young Veimama plants seldom survive early attacks, the stool failing to reach the fruiting stage; those of the Cavendish variety are more persistent, but the bunch, when thrown, is apt to be distorted and useless. A marked increase in the incidence of this disease was observed during 1935.

A motile bacillus was isolated from the vascular tissues of numerous wilted banana plants.

Corticium sp. was found causing a thread blight of coffee involving the leaves, shoots, and fruit, and both tobacco and tomato were severely damaged by bacterial wilt [*Bacterium solanacearum*] in the field.

Blattný (C.). **Nove adhaesivum k tekutým prostředkům na ochranu rostlin.** [A new adhesive for liquids used in plant protection work.]—*Ann. Acad. tchécoslov. Agric.*, xi, 4, pp. 372–374, 1936. [German summary.]

An account is given of preliminary experiments on various plants with a new alkaline liquid glue adhesive prepared by the Chemical Works, Kolin a.E. The results showed that at 0·25 per cent. strength, the preparation improved the spreading and adhesive properties of Bordeaux mixture and lime-sulphur, especially on plants with glabrous and shiny leaf surfaces, minimized the danger of leaf scorchings [see above, p. 189], and did not interfere with the toxicity of the fungicides. When added to 1 and 2 per cent. Bordeaux mixtures the glue retarded sedimentation at first, but increased its rate later on; the supernatant liquid was tinged slightly purplish, owing to the formation of an organic copper compound. Lime-sulphur solutions were emulsified by the glue. Further work is necessary to determine the doses to be usefully employed with the various fungicides.

Heal (R. E.), Schmitt (J. B.), & Ginsburg (J. M.). **Studies of certain new wetting agents and their application with insecticides and fungicides.**—*J. econ. Ent.*, xxix, 4, pp. 714–722, 1936.

An account is given of the writers' studies at the New Jersey Agricultural Experiment Station on the practical application of the closely related neutral wetting agents, aresket, areskap, and aresklene (Rubber Service Laboratories Co.). All the preparations can be used either in the form of dry powder or as solutions of varying strength, and all were found to be compatible with hard water. For plants with waxy foliage, e.g., cabbage, dilutions of 1 : 800 of either areskap or aresket and 1 : 1,600 of aresklene are necessary to produce satisfactory wetting, whereas leaves with lower interfacial tensions, e.g., apple, bean [*Phaseolus vulgaris*], and chrysanthemum, can be thoroughly wetted with any of the three spreaders at concentrations of 1 : 1,600 to 1 : 2,000. None of the preparations injured any of the 24 kinds of plants treated at 1 : 800 or 1 : 400, but at 1 : 200 all damaged apples, while peaches and roses were adversely affected by aresket and areskap, respectively.

The mixing of one part of either aresket or areskap with 500 parts of 300-mesh sulphur in a mortar resulted in a water-wettable sulphur, the former being the more efficient of the two and giving fair results even at the rate of 1 : 800. When sulphur was sifted into aresket at rates of 8 or 16 lb. per 100 galls. of 1 : 1,600, 1 : 2,000, and 1 : 3,000 dilutions it rapidly submerged, but at 1 : 4,000 the sulphur was only incorporated with some difficulty. In spray mixtures aresket at 1 in 2,000 was preferable to a dilution of 1 in 3,000.

In field experiments aresket at the rate of 1 oz. per 100 galls. was

satisfactorily used to wet flowers of sulphur in the preparation of orchard sprays (by adding the sulphur before the spray was diluted to its final concentration), or as a spreader for a sulphur-lime-lead arsenate combination, the addition of colloidal clay (wyojel) [*R.A.M.*, xv, p. 666], however, being requisite for adhesive purposes in the latter case.

TAYLOR (G. G.). **Application of orchard-sprays. III. Spray nozzles.**—*N.Z. J. Agric.*, liii, 2, pp. 68–76, 4 figs., 5 graphs, 1936.

The results of experiments conducted in New Zealand since 1933 [cf. *R.A.M.*, xv, p. 517] showed that the angle of the spray cone (calculated from patterns sprayed on white paper) increased with increase in pressure up to approximately 100 lb. With further increase in pressure up to 300 lb. the angle, after remaining constant over a short range of pressures which varied with the nozzle type, tended to diminish. With increase in diameter of disk aperture from $\frac{3}{64}$ to $\frac{8}{64}$ in. the angle increased, the rate of increase becoming greater as the number or diameter of the openings in the whorl-plate decreased or the angle of the openings increased. As the diameter of the disk aperture was increased, the cone became more hollow and the band of spray wider, while the size of the droplets increased. An increase in disk thickness from $\frac{2}{64}$ to $\frac{4}{64}$ in. narrowed the angle of the cone and increased the size of the droplets, though a further increase to $\frac{6}{64}$ in. had no further effect. Increasing the diameter of the whorl-plate openings from $\frac{4}{64}$ to $\frac{12}{64}$ in. rapidly decreased the angle of the spray cone, the droplets becoming slightly larger and the band of spray wider. When the angle of the whorl-plate openings was increased from 22·5° to 45°, the angle of the spray cone also increased; further increase to 67·5° gave further increase in the angle of the cone, but not to the same extent. As the angle of the openings was increased the band of spray became narrower and the droplets slightly finer. Increase in the number of the openings from 2 to 4 decreased the angle of the cone, increase to 6 causing a further, but less pronounced, decrease; at the same time the band of spray became wider, the cone less hollow, and the droplets slightly larger. The use of a strainer slightly increased the angle of the cone and improved the evenness of distribution, but did not affect the width of the spray or the size of the droplets.

FARRAR (M. D.). **The effect of petroleum oil sprays on insects and plants.**—*Bull. Ill. nat. Hist. Surv.*, xxi, 1, vi+32 pp., 1 pl., 17 figs., 4 graphs, 1936.

In these studies on insecticidal oil sprays it is stated that dormant oil emulsions can be used with sulphur fungicides in the dormant stage of tree development, but may cause serious injury if applied after the buds start to swell. Oil emulsions containing certain forms of copper (including Bordeaux mixture) are relatively safe on foliage, but the spray is of low insecticidal efficiency and difficult to [illegible] because of its corrosive action on metal. In fact there is no known [illegible] sufficiently toxic to fungi that can be added to oil emulsions without [illegible] the insecticidal efficiency of the oil or the fungicidal [illegible] of the fungicide. In laboratory experiments [illegible] with (Carpocapsa pomonella) and the addition of [illegible]

pyrethrum white oil emulsions reduced their efficiency from an average of 87·8 to 66·6 per cent. Fungicides partially soluble in the oil-phase of the emulsion decreased efficiency less than did flocculent materials, such as flowers of sulphur or Bordeaux mixture.

Godbout (F.) & Lavallée (E.). **The horticultural crop protection office : a new technical organization for the protection of vegetable crops.**—*Rep. Quebec Soc. Prot. Pl., 1934–1935*, xxvii, pp. 75–79, 1935. [Received January, 1937.]

The organization and methods of the newly established Horticultural Crop Protection Office, an offshoot of the Bureau of Plant Protection of the Ministry of Agriculture, Montreal, are based largely on those of the very successful orchard spray service. Growers are notified by post-card at opportune times for the application of control measures against pests and diseases of economic importance [tabulated lists of the incidence of which in 1934 are given], and field tests are made to demonstrate the efficacy of some of the recommendations proposed.

Edson (H. A.), Wood (Jessie I.), & Nance (Nellie W.). **Estimates of crop losses from diseases in the United States in 1935.**—*Plant Dis. Reptr, Supp.* 94, pp. 43–75, 1936. [Mimeographed.]

The estimates here presented of the losses in cereal, potato and other vegetable, fruit, and miscellaneous crops due to fungal, bacterial, virus, and physiological diseases in the United States in 1935 have been computed on the usual lines [*R.A.M.*, xiv, p. 780].

Sanborn (J. R.). **Gums produced by fungi : industrial utilization.**—*Industr. Engng Chem.*, xxviii, 10, pp. 1189–1190, 1 fig., 1 graph, 1936.

The gelatinous clot produced by the *Oidium* close to *O.* [*Oospora*] *lactis* in paper mills [*R.A.M.*, xiii, p. 667] is considered to be capable of further commercial application. The gum suspension may, for example, through its gelatinizing action, materially enhance the utility of many fibrous structures, provide mucilaginous surfaces for finely divided coating materials, and bind sheets of widely varying types. The potential industrial utilization of a number of other fungi is briefly discussed.

Porter (C. L.) & Porter (J. N.). **A fungous contamination of shaving cream.**—*Proc. Ind. Acad. Sci.*, xlv (*1935*), p. 102, 1936.

A brown stain of shaving cream was shown by inoculation experiments on sterilized soap media to be due to an *Aspergillus* of the *ochraceus* group, with a thermal death point between 90° and 100° C.

Tschudy (R. H.). **The use of acetates as a means of removing air bubbles from lacto-phenol mounts of fungi.**—*Stain Tech.*, xi, 4, p. 167, 1936.

The addition of a drop of methyl or ethyl acetate to material of *Chaetomium* mounted in glycerine jelly or lactophenol prevented the adhesion of air bubbles to the setae and spores. All the perithecia were

wetted by the acetate, which rapidly evaporated and thus facilitated the dissection of the organs.

SAKAMURA (T.). **Ueber einige für die Kultur von Aspergillen notwendigen Schwermetalle und das Befreiungsverfahren der Nährlösung von ihren Spuren.** [On some heavy metals essential for the cultivation of *Aspergilli* and the mode of eliminating traces of them from the culture medium.]—*J. Fac. Sci. Hokkaido Univ.*, Ser. V, Bot., iv, 3, pp. 99–116, 2 graphs, 1936.

In order to ascertain the quantities of certain heavy metals such as zinc, iron, copper, and manganese, essential for the growth in culture of *Aspergillus* spp. (represented in these experiments by *A. niger*, *A. tamarii*, and *A. oryzae*) [see next abstract], all traces of these elements occurring naturally in the medium (based on Pfeffer's solution plus glucose) were first eliminated by a process of absorption with 0·25 to 2 per cent. calcium phosphate requiring two hours for completion. On such a purified medium *A. niger* made practically no growth but responded by increase in weight and changes in conidial colour and shape to the addition to 10^{-7} mol. each of iron, zinc, and copper, and 10^{-6} mol. of manganese.

YOSHIMURA (FUJI). **The action of copper and manganese upon the formation and colour of conidium of some species of Aspergillus.**—*J. Fac. Sci. Hokkaido Univ.*, Ser. V, Bot., iv, 3, pp. 117–139, 6 pl., 37 figs., 1936.

Using media purified by Sakamura's method [see preceding abstract], the author found that in many species of *Aspergillus* sporulation is promoted by the presence of copper, the action of which requires to be supplemented, however, by manganese, the absence of the latter resulting in spherical cell formation. Combined in their correct proportions these metals produce adequate sporulation and normal conidial heads. The minimum concentration of the first-named element necessary for the purpose is 10^{-6} mol.

HAWKER (LILIAN E.). **The effect of certain accessory growth substances on the sporulation of Melanospora destruens and of some other fungi.**—*Ann. Bot., Lond.*, l, 200, pp. 699–717, 1 pl., 1 graph, 1936.

A crude extract of lentils, previously shown by Buston and Pramanik (*Biochem. J.*, xxv, pp. 1656, 1671, 1931) to stimulate the growth of *Nematospora gossypii* [*R.A.M.*, xvi, p. 35], was found to promote sporulation in *Melanospora destruens* and a number of other fungi. In the previous experiments both *i*-inositol (the baryta precipitate of the active substance) and an inositol-free fraction (the filtrate) were observed to be essential to the growth of *N. gossypii*, but the former was not necessary in the case of *M. destruens* and some of the other organisms used in the writer's tests. Sporulation increased parallel with additional amounts of extract up to an optimum. Comparative studies of the effects of the active substances from lentils and from fungal products (liquids staled by *Botrytis cinerea* or *Fusarium fructigenum* [*F. lateritium*]) showed that the process of sporulation in *M. destruens*, *Sordaria fimicola*, *Rosellinia necatrix*, and *Zygorrhynchus moelleri* [ibid.,

xiv, p. 655], and that of growth in *N. gossypii* responded similarly to the extracts from both sources; the fungal principles, however, were less rich in inositol than was the lentil extract.

These experiments are considered to bear directly on mycological technique in so far as they indicate a method of increasing and accelerating spore production, and this aspect of the work is discussed at some length.

Smith (Elizabeth C.). **The effects of radiation on fungi.**—*ex* Biological Effects of Radiation, Vol. ii, pp. 889–918, New York & London, McGraw-Hill Book Company, Inc., 1936.

An attempt has been made to assemble and briefly interpret the scattered and extensive literature on the effects of light on fungi under the general headings of visible and ultra-violet radiation, X-rays, and rays emitted from radio-active substances. The papers included in the bibliography as bearing on various aspects of the subject number 197.

Metlitzky (L. V.) & Soboleva (Mme V. P.). Изучение летального действия электрического поля высокой частоты на культуы грибов **Sclerotinia libertiana** и **Botrytis cinerea.** (Предварительное сообщение.) [Studies of the lethal action of the electrical high frequency field on cultures of *Sclerotinia libertiana* and *Botrytis cinerea.* (Preliminary report.)]—*Pl. Prot. Leningr., 1936*, 10, pp. 32–36, 1936. [English summary.]

In the authors' experiments pure cultures of *Sclerotinia libertiana* [*S. sclerotiorum*] and *Botrytis cinerea* were killed after 20 seconds' exposure to a high-frequency current under the following technical conditions: filament tension 11 volts, anode tension 2,000 volts, current in the secondary circuit 10 amp., wave-length 5·6 m., diameter of the secondary circuit plate 12 cm. In carrot roots inoculated with *S. sclerotiorum* and subjected to the same irradiation, for periods up to 3 minutes, the fungus was still alive two or three days later.

Dufrénoy (J.). **Les problèmes physiologiques en pathologie végétale.** [Physiological problems in plant pathology.]—*Ann. agron., Paris*, N.S., vi, 1, pp. 65–98, 6 figs., 1936.

After an introduction dealing with problems of plant pathology considered from the points of view of agronomy and physiology the author discusses in detail with full documentation the question of cellular metabolism in relation to thermodynamic principles, modifications of metabolism, the physiology and pathology of respiration and the cellular constants P_H and R_H. Emphasis is laid on the need for statistical analysis of experimental results [*R.A.M.*, xv, p. 519].

Das Gupta (S. N.). **Saltation in fungi.**—*Lucknow Univ. Studies*, v, 83 pp., 1936.

In this booklet, based on a course of lectures delivered at Lucknow University in 1934–5, the author gives a concise account of the available facts on various aspects of saltation. The subject is treated under the main headings of (1) genetics, (2) types of saltation, (3) induced saltation, (4) difference between parents and saltants, and (5) saltation, bud-variation, and plant chimeras. A bibliography of 152 titles is appended.

Baribeau (B.). **Geographical distribution of bacterial blight of Potatoes in Quebec.**—*Rep. Quebec Soc. Prot. Pl., 1934–1935*, xxvii, pp. 80–83, 1 map, 1935. [Received January, 1937.]

Bacterial blight of potatoes, a destructive disease of obscure origin first observed in Quebec in 1931, was detected in 30 counties of the Province in 1934, when a survey revealed the presence of infection in 719 fields (43 per cent.) with an area of 1,100 acres; of these 14·2 per cent. were severely attacked. The disease reaches a climax in hot, dry weather, the leaves drooping on their stalks and the whole plant wilting in a relatively short time. Dead plants usually show from 20 to 45 per cent. of the tubers affected with a yellowish-white soft rot.

Grieve (B. J.). **On Bacterium solanacearum Smith as the causal agent of the brown rot disease of Potatoes in Victoria.**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 79–85, 1 pl., 1936.

A description is given of the agent of a potato disease known as 'brown rot' or 'sore eye' in Victoria, the symptoms of which agree with those attributed to *Bacterium solanacearum* [*R.A.M.*, xvi, pp. 118]. There were found to be certain differences between the two organisms, the former, for instance, in contrast to *Bact. solanacearum*, ordinarily producing no water-soluble brown pigment on beef agar plates, forming a small quantity of acid from glucose, and (in the case of two isolations) making good growth in Uschinsky's solution. The Victoria potato organism was successfully inoculated into garden nasturtium (*Tropaeolum majus*), tomato, castor-oil plant [*Ricinus communis*], and black nightshade [*Solanum nigrum*], but failed to infect tobacco (another point of difference from *Bact. solanacearum*). As a result of these comparative studies the author concludes that the agent of potato brown rot in Victoria, and probably in other parts of the Commonwealth of Australia [ibid., viii, p. 804], is a distinct strain of *Bact. solanacearum*.

Suzuki (H.). **Studies on bacteria in the interior of Rice seeds (1)–(2).**—*Bot. & Zool.*, iii, pp. 749–760, 1931–1937, 5 figs., 1935. [Japanese. Abs. in *Jap. J. Bot.*, viii, 3, pp. (80)–(81), 1936.]

Three different bacteria, herein designated *Bacillus* A, B, and C, were isolated from the interior of rice seeds procured from various districts of Japan, the first being consistently associated with material from Okayama, Ibaragi, and Hokkaido, the second from Ibaragi, and the third from Hokkaido. The morphological, cultural, and physiological characters of the organisms are fully described.

Suzuki (H.). **Studies on the influence of some environmental factors on the susceptibility of the Rice plant to blast and Helminthosporium diseases and on the anatomical characters of the plant. II. Influence of differences in soil moisture and in the amount of nitrogenous fertilizer given. III. Influence of differences in soil moisture and in the amounts of fertilizers and silica given.**—*J. Coll. Agric. Tokyo*, xiii, pp. 277–331, 235–275, 2 pl., 1935. [Abs. in *Jap. J. Bot.*, viii, 3, pp. (79)–(80), 1936.]

The susceptibility of rice plants to *Piricularia oryzae* [see above, p. 154] in the author's inoculation experiments was found to be in

inverse proportion to the soil moisture and to the amount of silica supplied and directly proportional to the quantity of fertilizers given [*R. A. M.*, xiv, p. 653]. Plants grown on flooded soil with unit quantity of fertilizers are more resistant to blast disease than those cultivated under similar conditions with only half the quantity of fertilizers, while plants grown on flooded soil without silica are more resistant than those under similar situations with silica. The extent of infection in flooded soil with a unit quantity of nitrogenous fertilizers was higher than in the same soil dressed with only half a unit and lower than in dry soil with a similar ration of fertilizer. Susceptibility to *P. oryzae* was shown to be closely correlated with the thickness of the outer wall and the silicated external layer of the epidermal cells, the number of silicated epidermal cells, the size of the dumb-bell-shaped cells, and the number of silicated short cells.

FRANCO (R. M.). **La enfermedad del Arroz en el Valle del Cauca.** [The Rice disease in the Cauca Valley.]—*Agricultura, Bogota*, viii, 1, pp. 3–10, 1936.

Popular notes are given on the symptoms, mode of infection, and control by cultural measures and seed treatment of the rice diseases due to *Helminthosporium* [*Ophiobolus miyabeanus*: see above, p. 154] and *Piricularia oryzae* [see preceding abstract] in the Cauca Valley, Colombia. The Fortuna variety is the most susceptible to the former pathogen, Guayaquil showing a certain degree of resistance. Sporadic cases of infection by *Sclerotium oryzae* [*Leptosphaeria salvinii*: see above, p. 156] have also been observed.

FERRER (B. B.). **El problema de los cultivos de Arroz y Cacao en el Cauca.** [The problem of Rice and Cacao cultivation in the Cauca Valley.]—*Agricultura, Bogota*, viii, 2, pp. 90–91, 1936.

Popular notes are given on the symptoms, mode of infection, and control in the Cauca Valley, Colombia, of the *Sclerotium* and *Helminthosporium* diseases of rice [*Leptosphaeria salvinii* and *Ophiobolus miyabeanus*, respectively: see preceding abstract], and of the following fungi pathogenic to cacao: *Phytophthora* [*palmivora*: *R. A. M.*, xv, p. 705], *Diplodia* [*Botryodiplodia theobromae*: ibid., xv, pp. 16, 278], and *Rosellinia* [ibid., xiv, p. 37], of which the last-named can only be combated by preventive measures, such as the use of the resistant Pajarito variety, while the two former are amenable to improved cultural methods, supplemented by repeated applications of Bordeaux mixture at 10- to 15-day intervals.

Oidium leaf disease. — *Bull. Rubber Res. Scheme, Ceylon*, 33, 23 pp., 1936.

In the foreword to this bulletin R. K. S. Murray states that the Rubber Research Board of Ceylon appointed a committee to inquire into the advisability of recommending the Government to declare *Oidium heveae* a notifiable disease under the Plant Pests Ordinance, in which case the prescribed treatment could be enforced. The report of the Committee comprises section two of this bulletin. The decision reached was against compulsory measures, which, it considered, would be economically impracticable and also unjustifiable on other grounds.

An experimental campaign of sulphur-dusting small estates and holdings was carried out, however, in 1936 (the report of which, by W. I. Pieris, together with a memorandum by Murray, forms section three of this bulletin) to determine the type and cost of organization required to treat small estates and holdings. A total area of 1,003 acres was dusted, 2 one-acre holdings with sulphur bombs [*R.A.M.*, xiv, p. 654], the rest with a 3-h.p. dusting machine. The bombs ($\frac{3}{4}$, $\frac{1}{2}$, and $\frac{1}{4}$ lb.) were suspended from long bamboos, ignited, and held near the group of trees to be dusted, so that on explosion the wind carried the cloud of sulphur on to the trees. Sufficient bombs were used to give the amount of sulphur required for an ordinary dusting. On the whole, the bombs did not give very satisfactory results but may prove to be useful on small groups of early or late wintering trees, or for dusting inaccessible and very small holdings. Generally, the results of the dusting were beneficial, in some cases strikingly so. A total of 17 tons 10 cwt. 48 lb. sulphur was used, the cost of the treatment, including all charges, working out at the equivalent of about 10 rupees per acre. The small holder occupying less than 10 acres was unwilling to contribute anything to the cost of treatment, while the response of owners of small estates (10 to 30 acres) was disappointing.

Summing up in the final memorandum, Murray states that the work supports the conclusion reached by the Committee but suggests that the Rubber Research Scheme or the Department of Agriculture might usefully undertake to dust any small area whose owner gave notice that he desired and was prepared to pay for treatment.

[The report by W. I. Pieris also appears in *Quart. Circ. Ceylon Rubb. Res. Scheme*, xiii, 2–3, pp. 71–80, 1936.]

Castellani (E.). **Action de quelques formes microbiennes en culture pure sur l'absorption polaire du sol.** [The action of certain micro-organisms in pure culture on the polar absorption of the soil.]—*Boll. Sez. ital. Soc. int. Microbiol.*, viii, 10, pp. 197–201, 1936.

In preliminary investigations lasting from May, 1935, to June, 1936, on the modifications occurring in the colloidal complex of soil, the author inoculated argillaceous-calcareous soil in large glass tubes with *Hansenula anomala*, *Rhizobium* [*Bacillus*] *radicicola*. *Bacterium* [*B.*] *subtilis*, *Bact.* [*B.*] *coli*. *Bact.* [*B.*] *fluorescens liquefaciens*. *Sarcina lutea*, *Fusarium herbarum* [*F. avenaceum*], and *Macrosporium* [*Pleospora*] *herbarum*, the bacteria and yeasts by means of 10 c.c. bouillon cultures and the two fungi with cultures on wheat extract. Ordinary bouillon was added to the tubes containing the two last-named fungi and to their controls, to all the other tubes water alone was added twice.

After two months the controls showed a reduction in soluble calcium of 0·33 milli-equivalents (from 1·24 to 0·91) per 100 gm. of dry soil, the corresponding figures for the inoculated tubes ranging from a decrease of about the same value in the case of *F. avenaceum* and *B. subtilis* to an increase of 0·4 m.-eq. in that of *S. lutea* and *B. radicicola*. The exchangeable calcium in the controls increased by 0.2 m.-eq. (from 15·65 to 15·85), the corresponding figures for tubes inoculated with *P. herbarum*, *S. lutea*, *H. anomala*, *B. subtilis*, and *B. fluorescens liquefaciens* being 0·22, 0·18, 0·8, 1·1, and 2 m.-eq., respectively. *B. radicicola*,

B. coli and *F. avenaceum* caused decreases of 0·24, 0·6, and 2·8 m.-eq., respectively.

After one year all the tubes showed reduction of soluble calcium owing to absorption by the colloid, as shown by increase in exchangeable calcium. This increase amounted to 0·54 m.-eq. in the controls, and in the inoculated tubes ranged from 0·59 m.-eq. in the case of *B. coli* to 2·19 m.-eq. in that of *B. radicicola.*

It is concluded that there are certain micro-organisms present in the soil which bring about an increase in the exchangeable calcium of the colloidal complex, while there are others that decrease it. These organisms do not all act equally rapidly, and produce different results with different energizers. Soil exhaustion, it is suggested, may result from modifications in the colloidal complex brought about by special micro-organisms, such modifications being harmful to a given crop.

Zumstein (R. B.). **A preliminary study of soil pasteurization.**—*Proc. Ind. Acad. Sci.*, xlv (*1935*), pp. 94–98, 1936.

A study was made of the thermal death points of potato dextrose agar cultures of the following fungi commonly found inhabiting Indiana soils: *Sclerotium rolfsii*, *Fusarium* [*bulbigenum*] var. *lycopersici*, *F.* [*solani* var.] *eumartii* [*R.A.M.*, xvi, p. 56], *Sclerotium delphinii* [ibid., xv, p. 99], *Pythium de Baryanum*, *Macrosporium* [*Alternaria*] *solani*, and *Botrytis cinerea*, the minimum lethal temperatures for which were 50° C. (10 minutes), 65° (10), 55° (15), 50° (10), 40° (10), 50° (5), and 55° (15), respectively. From these data it would appear that the temperature usually recommended for the sterilization of greenhouse soils [ibid., xv, p. 824] (82°) might be somewhat reduced, but further experiments with soil as a medium are required to verify this supposition.

Novogrudski (D.). **Использование микробов в борьбе с грибковыми заболеваниями культурных растений.** [The use of micro-organisms in the control of fungal diseases of cultivated plants.]—*Bull. Acad. Sci. U.R.S.S., Biol. Sér., 1936*, 1, pp. 277–293, 1936. [English summary.]

After briefly referring to the importance of antagonism between soil-inhabiting micro-organisms and plant-pathogenic fungi as a factor in disease [see above, p. 150], the author describes two methods which have been devised in the U.S.S.R. for the isolation of bacteria lysogenic to fungi from soil samples and from the surface of diseased plants. The first consists in placing mois[illegible] of the soil under investigation on the aerial mycelium of a [illegible] of a given fungus and incubating the whole at 2[illegible] C. If an [illegible] organism is present, the mycelium [illegible] [illegible] [illegible] tes and incubating them at 25°. During the first [illegible] usual fungi and bacteria is seen, but if [illegible] ent, their activity becomes apparent

by the lysis of the fungi, and they can be isolated in pure culture as above mentioned.

These methods were successful in the isolation of several strains of bacteria which caused the lysis of various species of *Fusarium*, *Colletotrichum*, and other plant pathogenic fungi. Pot experiments carried out with strains antagonistic to *F. graminearum* [*Gibberella saubinetii*] and *F. lini*, showed that inoculation of sterilized soil with the corresponding bacterium 24 hours before the introduction of *G. saubinetii* completely protected wheat seedlings from infection by this fungus, whereas all the control plants were killed off, while inoculation of unsterilized flax-sick soil with the other bacterial strain reduced the infection of flax seedlings with *F. lini* from 26·6 per cent. in the control to 9·5 per cent.

Bell (A. F.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd, 1935*, pp. 19–27, 1 graph, 1936.

Reviewing the progress of the campaign for the eradication of sugar-cane gumming disease [*Bacterium vasculorum*: *R.A.M.*, xv, p. 320; xvi, p. 126] in southern Queensland, the author points out that in 1929, when the disease reached its climax, an intensive survey of the Bundaberg district revealed fewer than 50 disease-free farms. During the period from 1924 to 1929 the yield of cane in the locality fell from 16·5 to 12·5 tons per acre. Resistant varieties were introduced, and it is estimated that in 1936, P.O.J. 213, Co. 290, P.O.J. 2878, and P.O.J. 234 will form, respectively, 30, 25, 25, and 10 per cent. of the planting, of which 94 to 95 per cent. will consist of highly resistant varieties. A survey in the quarantine area at Mulgrave in March–April, 1936, showed the disease to be present on two further farms and probably present on two others; the boundaries of the area were accordingly extended. The disease was ascertained to be readily transmissible to maize, particularly the Fitzroy variety, by hypodermic infection, and *Bact. vasculorum* was reisolated from the infected plants. In another trial seeds of several maize varieties were interplanted with inoculated S.J. 4 cane, and the disease was transmitted under natural conditions to Fitzroy maize, from which the causal organism was again reisolated.

Fiji disease [ibid., xvi, p. 125] remains of direct importance in the Maryborough district and of indirect importance in all other parts of southern Queensland where, although the disease may be present only in scattered localities, the new high-numbered P.O.J. canes are extremely susceptible.

In northern Queensland chlorotic streak [fourth disease: ibid., xv, p. 320] was very prevalent, especially in low-lying areas. The economic importance of the disease is unquestionably considerable and the local farmers are availing themselves widely of the supply of disease-free Badila canes offered by the Bureau of Sugar Experiment Stations at a reasonable price. In a comparative field trial of diseased (70 per cent. diseased setts) and healthy Badila cane, the former showed a loss of yield of 17·9 per cent. In a second trial with the same variety in another locality the plants used were 100 per cent. diseased, but one-half of the material was submitted to the hot-water treatment. The total yield from the treated plots (two crops) amounted to 58·56 tons per acre, as against 41·9 tons for the untreated. Although no symptoms were seen

in the plant crop, the ratoon crop rapidly became completely infected, but in spite of this the more vigorous stand resulting from the originally healthy stools gave an increased yield of 6·94 tons per acre.

In a varietal resistance trial of new seedlings for resistance to red stripe [*Bact. rubrilineans*: ibid., xvi, p. 127] the percentage of deaths ranged from 34·7 to 11·5 (average 24·4) in the 15 hybrids tested, as against 34·4 for Badila.

Sun scald was prevalent in southern Queensland, while in the north the harmless but conspicuous banded sclerotial disease [*Sclerotium* sp.: ibid., xi, p. 432] was a concomitant of the prolonged wet season.

Pineapple disease [*Ceratostomella paradoxa*: ibid., xv, p. 558] was more prevalent than usual in late autumn and winter plantings, one 60-acre planting on the Lower Burdekin failing almost entirely. The disease invariably appeared to depend largely on unfavourable planting conditions.

Edgerton (C. W.) & Tims (E. C.). **Testing Canes for disease resistance in Louisiana.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 494–497, 1936.

Since sugar-cane does not produce viable seed in Louisiana most of the crossing is done at Canal Point, Florida, and the seedlings sent to Louisiana for testing. The methods adopted for tests against stubble deterioration [*R.A.M.*, xiv, p. 469], red rot [*Colletotrichum falcatum*], and mosaic are discussed in detail [ibid., xvi, p. 62].

Rands (R. D.), Abbott (E. V.), & Summers (E. M.). **Disease resistance tests on Sugar-cane seedlings and initial selection procedure in the southern United States.**—*Proc. fifth Congr. int. Soc. Sug. Cane Tech., Brisbane, 1935*, pp. 484–492, 1936.

In sugar-cane breeding work carried out in the United States [see preceding abstract] seedling tests for resistance to eye spot (*Helminthosporium sacchari*) [*R.A.M.*, xvi, p. 127], brown stripe (*H. stenospilum*) [loc. cit.], and *Cercospora longipes* [ibid., xv, p. 607] are carried out in Florida, to red stripe (*Phytomonas* [*Bacterium*] *rubrilineans*) in Georgia, and to the major diseases mosaic, red rot (*Colletotrichum falcatum*), and root rot (chiefly *Pythium arrhenomanes*) in Louisiana. Two types of tests are conducted: (*a*) those of a qualitative nature, e.g., leaf spot comparisons and nursery records, and (*b*) those of a quantitative nature to determine the effect of a disease on yields. The authors discuss only the former in this paper, in relation to seedling eliminations and further breeding work Details are given of the procedure followed in tests for resistance to mosaic, red rot [ibid., xvi, p. 62], root rot, and other diseases. Root rot susceptibility is estimated roughly by comparison with the known reaction of control varieties interspersed throughout the plants. The estimates are complicated by varying degrees of virulence of the strains of *P. arrhenomanes* and its uneven distribution, and the test nurseries are artificially inoculated during a rainy period with a mixture of the most virulent strains. Accurate comparisons of varietal resistance are usually limited to greenhouse tests. Field tests of resistance to sheath

rot (*Cytospora sacchari*), red stripe (*Phytomonas rubrilineans*), and pokkah-boeng (*Fusarium*) [*Gibberella moniliformis*: ibid., xii, p. 679] are also based on visual estimates with sometimes counts of sucker suppression, or top-rotting (for the two last-named).

Preliminary results of studies conducted during the last four years denote that incomplete dominance of resistance to mosaic is indicated by five primary crosses between susceptible noble varieties and various collections of the immune *Saccharum spontaneum*. Mosaic susceptibility appeared to be increased as a result of back-crossing various resistant seedlings with the susceptible Co. 281 parent. Tests on 705 seedlings showed that resistance or susceptibility to either mosaic or red rot was independent of the reaction of the same seedlings to the other disease.

VERPLANCKE (G.) & VANDERBROECKE (R.). **Contribution à la flore mycologique belge.** [A contribution to the Belgian mycological flora.]—*Bull. Soc. Bot. Belg.*, lxix, 1, pp. 69–95, 20 figs., 1936.

An annotated list is given of 191 parasitic and saprophytic fungi (mostly imperfect and including 48 species of *Phoma*) newly observed in Belgium. Twenty species are described as new.

CAMPAGNA (E.) & LACHANCE (R. O.). **Annotated list of the Ustilagines observed in Quebec.**—*Rep. Quebec. Soc. Prot. Pl., 1934–35*, xxvii, pp. 50–52, 1935. [Received January, 1937.]

Brief notes are given on 223 Ustilaginales collected in Quebec, mostly on cereals and grasses.

MALENÇON (G.). **Notulae mycologicae Maroccanae.** [Moroccan mycological notes.]—*Rev. Mycologie*, N.S., 1, 5, pp. 257–275, 2 pl., 1936.

Brief notes are given on new or interesting fungal records made by the author in Morocco, of which the following may be mentioned. *Puccinia graminis* occurred in the aecidial stage on *Berberis hispanica*; *Uromyces betae* was rare on beet; *U. caryophyllinus* was present on cultivated carnations; *U. appendiculatus* was widespread on beans, on which it sometimes causes severe leaf fall; *U. renovatus* [*R.A.M.*, xiii, p. 183] was very common in northern Morocco on *Lupinus angustifolius*, *L. luteus*, and *L. hirsutus*; *U. striatus* occurred on lucerne [ibid., xiii, p. 290]; *U. fabae* [ibid., xv, p. 529] was widely distributed on broad beans [*Vicia faba*], on which it inflicts severe damage in rainy seasons; and *U. ervi* (a new record for Morocco) caused heavy losses on lentils in several localities, the leaves, stems, and pods being covered with teleutosori. *Kuehneola* [*Cerotelium*] *fici* [ibid., xiv, p. 560] was very prevalent on *Ficus carica* throughout the coastal regions, and *C. fici* var. *abyssinica* was newly recorded on *F. retusa* in the streets of Rabat. *Phragmidium subcorticium* occurred on cultivated roses, *Melampsora lini* [ibid., xvi, p. 41] on flax, and *M. allii-populina* [ibid., xv, p. 529] on *Populus nigra*. *Zaghouania phillyreae* [ibid., xv, p. 372] was frequent on *Phillyrea* sp., *Uredo* [*Melampsorella*] *ricini* [ibid., iv, p. 590] was observed, in the *Uredo* stage only, on *Ricinus communis*, and *U. quercus* on *Quercus suber*.

Bondartzeva-Monteverde (Mme V. N.), Gutner (L. S.), & Novosselova (Mme E. D.). Паразитные грибы оранжерей Ботанического Института Академии Наук СССР. [Parasitic fungi in the glasshouses of the Botanic Institute of the U.S.S.R. Academy of Sciences.]—*Acta Inst. Bot. Acad. Sci. U.R.S.S.*, Sér. II (*Pl. Cryptogamae*), *1936*, 3, pp. 715–802, 15 figs., 1936. [German summary.]

This is an annotated list of 229 species of parasitic fungi which were collected during the spring of 1933 in the temperate and hot-houses of the Botanic Gardens in Leningrad, including 73 species described as new to science, with Latin diagnoses. The majority consists of imperfect fungi (chiefly belonging to the genera *Colletotrichum*, *Gloeosporium*, *Phomopsis*, and *Phyllosticta*) causing various leaf spots, Ascomycetes being sparsely represented.

Ziling (M. K.). Грибы Дальневосточного края. [Fungi of the Far East.]—*Acta Inst. Bot. Acad. Sci. U.R.S.S.*, Sér. II (*Pl. Cryptogamae*), *1936*, 3, pp. 679–697, 1936. [German summary.]

This is a briefly annotated list of 202 species of fungi [including 26 new species for which Latin diagnoses are provided] collected by the author in 1928 in the Russian Far East on various plant hosts. The following may be mentioned. *Gnomoniella oharana* Nisikado & Matsumoto [cf. *Gnomonia oharana* Nisikado & Matsumoto, 1929: *R.A.M.*, ix, p. 72] on living leaves of *Ulmus parvifolia*, *U. pumila*, *U. laciniata*, and *U. japonica*. The Far Eastern fungus differs from the Japanese in the size of its ascospores and conidia, which measure 13 to 17 by 5 to 9 μ and 3 to 3·8 by 1·3 μ, respectively, instead of 10 to 26 by 3·6 to 6 μ and 1·6 to 2·6 μ. *Trametes persoonii* (Mont.) Lloyd on dying *Ulmus* sp. trees is not of considerable economic importance. *Stagonospora koraiensis* n.sp. on living needles of *Pinus koraiensis* forms numerous immersed, erumpent pycnidia 160 to 230 μ in diameter, with stylospores cylindrical in shape or tapering towards the apex, 3-septate, hyaline, and 30 to 50 by 3·8 to 5 μ. *Septoria convallariae-majalis* n.sp. on living leaves of *Convallaria majalis* forms amphigenous, linear or angular-ovate, sometimes confluent, dark green to olivaceous spots, with a purplish-brown margin. The pseudopycnidia are hypophyllous, rarely amphigenous, immersed, globose, brown, and 90 to 120 μ in diameter. The stylospores are straight or curved, 3- to 5-septate, and 48 to 57 by 1·3 to 1·5 μ. *S. physalidis* n.sp. was found on the living leaves of *Physalis alkekengi*, *S. ulmi* Ell. & Ev. on *Ulmus japonica*, and *Cercospora amurensis* n.sp. on living leaves of *Syringa amurensis*.

Deighton (F. C.). **XXXVIII. Preliminary list of fungi and diseases of plants in Sierra Leone. XXXIX. List of fungi collected in Sierra Leone.**—*Kew Bull.*, *1936*, 7, pp. 397–424; 424–433, 1936.

Both of these lists of fungi found in Sierra Leone consist almost entirely of records made by the author since 1926 and identified by the Imperial Mycological Institute, in collaboration with Miss Wakefield, Mr. Petch, and Dr. Chupp. In the first list the hosts are arranged in alphabetical sequence, and under the part of the host affected are given

the causal organism or disease, the locality and date of collection, and the collection number. The second list is really a fungus index of the first, with the addition of entomogenous and saprophytic fungi; the fungi are listed according to their systematic position and the genera of the host plants are indicated.

ROLDAN (E. F.). **New or noteworthy lower fungi of the Philippine Islands, I.**—*Philipp. J. Sci.*, lx, 2, pp. 119–123, 2 pl., 1936.

An annotated list is given of seven species of fungi, five of which are new to science and are furnished with Latin and English diagnoses, and the other two reported for the first time from the Philippine Islands. *Oenothera lamarckiana* petioles are attacked by *Cylindrocladium scoparium* [*R.A.M.*, x, p. 792], this being apparently a new host for the fungus. *Cercospora chrysanthemi* was found infecting *Chrysanthemum coronarium* foliage [ibid., xiv, p. 742]. Living leaves of *Pithecolobium dulce* bore irregularly circular, pale yellow lesions due to *Colletotrichum pithecolobii* n.sp., which is characterized by numerous black, non-septate setae with acute apices, 64 to 125 by 4 to 10·5 μ, and granular, falcate conidia, 14 to 28 by 3 to 7 μ. *Phoma rosaena* n.sp., the agent of a stem spot of roses, forms erumpent, subglobular, brownish, slightly papillate pycnidia, 75 to 240 μ in diameter, and elliptical to sub-cylindrical spores, 3·5 to 6 by 1·5 to 2·5 μ. Amphigenous, brownish lesions, 0·25 to 3 mm. in diameter, were produced on tomato foliage by *Helminthosporium lycopersici* n.sp., the hyphophyllous conidiophores of which, 70 to 145 by 7 to 9 μ, bear clavate, straight or slightly curved, 4- to 12-septate, olive-brown, conidia, 50 to 107 by 10 to 18 μ [but see *H. lycopersici* Maublanc & Roger: ibid., xv, p. 830]. The leaves of *Carthamus tinctorius* are subject to a spotting by *Phyllosticta carthami* n.sp., which sometimes involves the whole leaf. The pycnidia measure 63 to 133 μ, the ostiole 14 to 21 μ, and the oval or elliptical conidia 7 to 10 by 2 to 2·6 μ. *Pestalozzia homalomenae* n.sp. is recorded on *Homalomena philippinensis*.

BOSSCHIETER (J. C. A.). **Helopeltis en redrust in verband met werkmethoden.** [*Helopeltis* and red rust in relation to cultural operations.]—*Bergcultures*, x, 45, pp. 1415–1416, 1936.

One of the most effective means of eliminating *Helopeltis* and red rust [*Cephaleuros parasiticus*] infection from Java tea gardens [*R.A.M.*, xiii, p. 272] is the provision of ample leguminous shade in the form of *Albizzia*, dadap [*Erythrina hypaphorus*], *Deguelia*, lamtoro [*Leucaena glauca*], and the like, which should be regularly renewed. Another important precaution is the adoption of a conservative method of gathering the leaves, avoiding the so-called 'fine plucking' which puts an excessive strain on the bushes for the sake of securing a superior commercial product.

SMEE (C.). **Nyasaland Tea and pests and diseases.**—*Nyasald Tea Ass. quart. J.*, i, 2, pp. 1–5, 1936.

In connexion with some popular notes on the phytopathological aspects of tea-growing in Nyasaland, it is mentioned that *Armillaria*

mellea [*R.A.M.*, xv, p. 780] occurs in the soil at a depth considerably exceeding the 2-ft. limit reported from other countries. Increased attention is consequently being paid to the laborious and costly operation of stumping on recently cleared land, especially with a view to the elimination of *Afrormosia angolensis* and *Parinarium mobola* [ibid., xiv, p. 14].

Matzulevitch (B. P.). Дифференциация растительных вирусов серологическим методом. [Differentiation of plant viruses by the serological method.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 37–49, 1936. [English summary.]

After giving a cursory review of the work hitherto done in the identification of plant viruses by serological methods, the author outlines in some detail his own researches in this field. The tests were made with purified viruses of tobacco mosaic (Johnson's tobacco virus 1) [*R.A.M.*, xvi, p. 66 and next abstracts], tomato streak [ibid., xv, p. 614], and potato X virus [ibid., xvi, p. 116] (obtained from different artificially inoculated hosts and filter plants). The antigen of the first-named was prepared by precipitation with aluminium gel, the second by absorption with carbon and subsequent treatment with carbon dioxide, and the last by precipitation with kaolin; and the respective antisera were obtained by injecting these viruses intraveinously into rabbits. The results [which are tabulated] showed intensive precipitation of the antisera with their specific antigens, some fluctuations in intensity being, however, noted in the reaction of the antisera with the antigens derived from different hosts. Antigens of related viruses, e.g., potato mosaic (Up-to-Date) and potato streak (Great Scot), reacted similarly with mosaic antisera, and antigens of viruses present in a latent state in the host also gave reactions but of lesser intensity. No reactions could be obtained with antigens from healthy plants and antisera of non-related viruses. These results indicate the possibility of applying serological reactions to the identification of plant viruses.

Chester (K. S.). **Liberation of neutralized virus and antibody from antiserum-virus precipitates.**—*Phytopathology*, xxvi, 10, pp. 949–964, 2 figs., 1936.

Virus-immune serum, freed from the antibodies for healthy tobacco proteins [*R.A.M.*, xvi, p. 65 and next abstracts], was purified by the elimination of the protein fractions soluble in 30 and 43 per cent. saturated ammonium sulphate and of the pseudo-globulins rendered insoluble in water by heating to 57° C. The resultant water-clear fraction was found after dialysis to have undergone little or no loss of virus-antibody content, but showed only a minute proportion of the non-specific inhibitory action of unpurified serum. The inhibitory property of normal serum was found to be distributed among all the protein fractions of the serum.

Neutralized mixtures of tobacco mosaic virus juice and immune serum were prepared by titrating the serum with the juice until the supernatant liquid after centrifuging contained neither serum nor virus

in excess, as determined by precipitin tests. Neither free virus nor antibodies were recovered from such mixtures by various chemical, physical, and serological treatments, but the partial digestion of the mixtures with pepsin resulted in the destruction of the antibodies and the recovery of a large proportion of the virus. Supplementary evidence of the liberation of virus under these conditions was afforded in other experiments followed by infectivity tests. No infectious matter was obtained by the partial digestion of virus-free immune serum by pepsin, thereby proving that the virus antibodies are not merely virus particles modified by the serum proteins. These data are interpreted as demonstrating that, when tobacco mosaic virus is neutralized by its specific immune serum, it is not destroyed but held in an impotent, non-infective condition from which it may be liberated by the digestion of the antibodies by pepsin.

When neutral precipitates of potato virus X [ibid., xvi, p. 53] and its specified serum were acidified to P_H 4·8 or below, the precipitate underwent dissolution and large amounts of free antibody were recoverable in the supernatant fluids, denoting that the antibody survives the neutralization of this virus by its specific serum. Titration of the X virus with its immune serum showed that one unit of antibody is capable of combining with, and being saturated by, any number of units of antigen from 1 to 8.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. VII. An improved method for the preparation of crystalline Tobacco mosaic virus protein.**—*J. biol. Chem.*, cxv, 3, pp. 673–678, 1936.

Details are given of an improved method for the preparation of crystalline tobacco mosaic virus protein [*R.A.M.*, xv, p. 611 and preceding and next abstracts] whereby the yield of the latter can be increased from 40 to 80 per cent. of the crude twice-precipitated globulin fraction.

In a representative experiment [which is fully described] 11 rapidly growing tobacco plants in 6-in. pots in a greenhouse were inoculated by rubbing the leaves with 2 c.c. of a solution of 2 mg. of crystalline tobacco mosaic virus protein in 0·1 M sodium phosphate at P_H 7 on 14th April, 1936, when the plants were 2 to 4 in. in height. Four weeks later they were cut, frozen, ground, and the pulp, weighing 1,360 gm., twice extracted with 0·1 M sodium phosphate at P_H 7. The two extracts were combined, 585 gm. ammonium sulphate added, and the precipitated globulin collected by means of gravity filtration. The virus activity of the filtrate and of the precipitate after this and subsequent treatments was determined by means of infectivity tests on *Nicotiana glutinosa*, using the half-leaf method. The preparations used for these tests were first dialysed against distilled water and then adjusted till they contained 0·1 M phosphate at P_H 7 before inoculation.

The filtered precipitate, consisting of 3·9 gm. protein, was dissolved in 500 c.c. 0·1 M phosphate solution at P_H 7 and filtered, through celite, washed with 100 c.c. of the phosphate and the protein in the 600 c.c. filtrate precipitated by the addition of 120 gm. ammonium sulphate. The precipitated protein was collected on filter paper and dissolved in 500 c.c. of the phosphate. To this solution, containing 3 gm. protein,

was added 40 gm. ammonium sulphate, and the slightly turbid solution was filtered through celite. In other experiments the amount of ammonium sulphate required to induce turbidity varied somewhat with the protein concentration of the solution, but was usually about 8 to 11 per cent. by weight. The celite filter cake was washed with 100 c.c. of 8 per cent. ammonium sulphate solution and the filtrate added to the main portion. The clear, brown filtrate, containing 2·6 gm. protein, was supplemented by 72 gm. ammonium sulphate to bring the ammonium sulphate concentration to 20 per cent. by weight, and the precipitated protein was removed by filtration through celite. Most of the active protein on the celite was removed by one extraction with 400 c.c. and two with 150 c.c. of the phosphate. The combined extracts, containing 2·5 gm. protein, were adjusted to P_H 4·5 by the addition of 6 c.c. of 3 M sulphuric acid and filtered through celite which retained all the virus activity. The celite filter cake was suspended in 300 c.c. water to make a 1 per cent. protein suspension and adjusted to P_H 8 by the addition of 7 c.c. of an aqueous suspension of 5 per cent. calcium oxide. The suspension was then filtered through celite, and the filter cake extracted three times with 150 c.c. water at P_H 8. On combining the four filtrates an almost colourless opalescent solution was produced, the protein of which was crystallized by successive additions of (1) 75 gm. solid ammonium sulphate, (2) 6 c.c. of a 5 per cent. glacial acetic acid solution in 0·5 saturated ammonium sulphate, and (3) 20 c.c. saturated ammonium sulphate solution. The yield of once-crystallized protein was 2·3 gm. or 77 per cent. based on the crude twice-precipitated globulin.

Eriksson-Quensel (Inga-Britta) & Svedberg (The). **Sedimentation and electrophoresis of the Tobacco-mosaic virus protein.**—*J. Amer. chem. Soc.*, lviii, 10, pp. 1863–1867, 8 graphs, 1936.

An ultracentrifugal and electrophoretic study was conducted at the Laboratory of Physical Chemistry, University of Upsala, Sweden, on Stanley's crystalline tobacco mosaic virus protein [see preceding abstracts].

Sedimentation velocity runs by the light absorption and the refractive index or scale method revealed a considerable lack of homogeneity in respect of molecular weight. From the scale runs distribution curves were calculated. The position of the maxima and the dispersion changes with the hydrogen-ion concentration; at P_H 6·8 some 65 per cent. of the material has a molecular weight ranging from 15 to 20 millions, assuming the dissymmetry constant to be the same as for other high molecular proteins. Possibly the virus protein may be homogeneous in its native state and undergo the above-mentioned changes as a result of the drastic modes of operation involved in the isolation process, especially with regard to deviations from neutrality in the hydrogen-ion concentration, to which it is highly sensitive. Sedimentation equilibrium runs indicate a mean molecular weight of the same order (17 millions). Electrophoretic determinations showed the virus protein to be chemically well defined and practically homogeneous. These data are interpreted as being definitely opposed to the bacterial theory of the nature of viruses [*R.A.M.*, xvi, p. 130].

Hollaender (A.) & Duggar (B. M.). **Irradiation of plant viruses and of microörganisms with monochromatic light. III. Resistance of the virus of typical Tobacco mosaic and Escherichia coli to radiation from λ 3000 to λ 2240 Å.**—*Proc. nat. Acad. Sci., Wash.*, xxii, 1, pp. 19–24, 3 graphs, 1936.

This is an expanded account of the writers' experiments on the inactivation of tobacco mosaic virus and *Escherichia* [*Bacillus*] *coli* by exposure to ultra-violet rays at relatively short wave-lengths, a summary of which has been noticed from another source [*R.A.M.*, xv, p. 403].

Holmes (F. O.). **Interspecific transfer of a gene governing type of response to Tobacco-mosaic infection.**—*Phytopathology*, xxvi, 10, pp. 1007–1014, 1936.

A necrotic type of response to infection by the tobacco mosaic virus was introduced into *Nicotiana paniculata* by transferring a dominant gene *N* (necrosis) from *N. rustica*, through repeated back-crosses of the hybrid *N. paniculata* × *N. rustica*, using *N. paniculata* pollen, but retaining in each generation only individuals reacting to inoculation by the production of necrotic lesions [cf. *R.A.M.*, xiv, p. 126]. The necrotic-type variety of *N. paniculata* thus developed was self-fertile and externally resembled the ordinary mottling type of the same species. In its response to infection, however, it was essentially similar to *N. rustica*, succumbing to systemic necrosis if infected in the juvenile stage and localizing the virus when inoculated at maturity.

A dominant gene *D* (unmodified necrosis), not detected in *N. rustica*, was observed in the newly derived necrotic-type *N. paniculata* plants and found to segregate independently with respect to the gene *N*. In the presence of the latter, *D* permitted the prompt appearance of necrotic primary lesions and prevented extensive chlorosis of the surrounding tissue.

Valleau (W. D.) & Johnson (E. M.). **Tobacco diseases.**—*Bull. Ky agric. Exp. Sta.* 362, 62 pp., 28 figs., 1936.

This bulletin is a revised edition of *Bull.* 328 published in 1932 [*R.A.M.*, xii, p. 117].

Morozoff (B. G.) & Zelenina (Mme I. N.). Болезни семян Табака – „плесневение". [Tobacco seed diseases: 'mouldiness'.]—*Pl. Prot. Leningr., 1936*, 10, p. 149, 1936.

The authors state that on the southern coast of the Crimea tobacco seed is often attacked by a greyish mould, which binds the seeds into clumps, and reduces their germinability by from 10 to 60 per cent. The condition is caused by a species of *Alternaria* differing somewhat in its morphology from *A. tenuis*. There was some evidence that infection of the seed may occur through the stigma of the tobacco flower, or may be carried to the seed cases by gnawing insects, before or after dehiscence.

Morozoff (B. G.), Zelenina (Mme I. N.), & Kozmina (Mme O. A.). Влияние болезней на вес и качество семян. [Effect of diseases on the weight and quality of seeds.]—*Pl. Prot. Leningr.*, *1936*, 10, pp. 148–149, 1936.

The authors state that preliminary determinations have shown that 90 per cent. of tobacco plants infected at an early stage by mosaic fail to produce any seed, the yield of the remaining 10 per cent. being less than 25 per cent. of the normal; later infections result in a smaller reduction of the yield of seed. It was further found that the yield of plants suffering from hollow stalk [*Bacillus aroideae*: *R.A.M.*, vii, p. 121; xv, p. 346] is reduced by 51 per cent., from powdery mildew [*Erysiphe cichoracearum*] by 15 per cent., and from ring spot [ibid., xv, p. 754] by 27 per cent. None of these diseases appeared to have any influence on the viability of the seed harvested.

Ghimpu (V.). **Bacteriozele Tutunului.** [Tobacco bacterioses.]—*Bul. Cultiv. Ferment. Tutun.*, xxv, 3, pp. 266–324, 28 figs., 1936.

This is a semi-popular account of tobacco bacterioses, their distribution, symptomatology, economic importance, host plants, and other points of interest in connexion therewith, supplemented by information on the characters of the causal organisms and on their control. The following pathogens are discussed: *Bacterium tabacum*, *Bact. angulatum*, *Bact. solanacearum*, *Bact. melleum* [*R.A.M.*, xiv, p. 659], *Bact. pseudozoogloeae* [ibid., xiv, pp. 473, 659], *Bact. heteroceum* [ibid., xvi, p. 85], *Bact. polycolor* [ibid., xiv, p. 16], *Bact. maculicola* [ibid., xiv, p. 658], *Bacillus aroideae* [see preceding abstract], *B. carotovorus* [ibid., xiv, p. 658], and *B. aeruginosus* [ibid., vii, p. 410].

Dufrénoy (J.) & Shapovalov (M.). **Réactions histologiques et cytologiques des Tomates à l'infection par Aplanobacter michiganense E. F. Smith.** [The histological and cytological reactions of Tomatoes to infection by *Aplanobacter michiganense* E. F. Smith.]—*C.R. Soc. Biol., Paris*, cxxiii, 31, pp. 695–696, 1936.

The perivascular elements of French tomato plants attacked by *Aplanobacter michiganense* [*R.A.M.*, xvi, p. 113], separated from one another by dissociation of the middle lamella, were almost entirely occupied by the vacuolar solution, coloured yellowish-brown by phenolic compounds. The parenchyma cells at the periphery of a cavity in the internal phloem were in a state of active division and were intersected by bacterial zoogloeae; a tendency to the formation of a hyperplastic cicatricial layer was apparent. The cells of this reactional tissue rapidly form drops of a solution rich in phenolic compounds.

Fish (S.) & Pugsley (A. T.). **Bacterial canker of Tomatoes.**—*J. Dep. Agric. Vict.*, xxxiv, 10, pp. 520, 528, 1 fig., 1936.

A brief, popular account is given of the symptoms and control of tomato bacterial canker (*Phytomonas michiganensis*) [*Aplanobacter michiganense*], which, following its recent appearance in New South

Wales [*R.A.M.*, xiv, p. 610], has now been recorded in Victoria. For control the authors recommend the use of seed from healthy plants extracted by fermentation without the addition of water, the disinfection of seed of unknown origin with mercuric chloride ($\frac{1}{4}$ oz. in 5 galls.) for five minutes, the destruction of diseased material, and crop rotation.

Bamford (Katherine F.) & Van Rest (E. D.). **The relationship between chemical composition and mechanical strength in the wood of English Ash.**—*Bio-chem. J.*, xxx, 10, pp. 1849–1854, 1936.

Four out of six of the English ash (*Fraxinus excelsior*) trees from Norfolk examined in connexion with studies on the relationship between chemical composition and mechanical strength in the wood showed the heartwood discoloration commercially known as 'black heart'. The defect was found by statistical analyses to be independent of any irregularities in the relative proportions of the major components of the trees, being apparently associated rather with some constitutional peculiarity in the extractives. Support is lent to this view by the observation that an evaporated aqueous or alcoholic extract of 'black' heartwood emitted a strong phenolic odour absent from extracts of normal material.

Van Vloten (H.). **Onderzoekingen over Armillaria mellea (Vahl) Quel.** [Investigations on *Armillaria mellea* (Vahl) Quel.]—*Fungus, Wageningen*, viii, 2, pp. 20–23, 4 figs., 1936.

Marked differences in the capacity for rhizomorph formation and corresponding virulence were observed in laboratory experiments at Wageningen with pure cultures of *Armillaria mellea* from a number of different hosts [*R.A.M.*, ix, p. 331; xiii, p. 553; xv, p. 232, *et passim*]. Thus, potato tubers inoculated with strains forming no rhizomorphs from horse-chestnut (*Aesculus hippocastanum*) and *Pinus sylvestris* [ibid., xiv, p. 803] remained healthy, those infected with the peach [ibid., vi, p. 237] and oak [ibid., vii, p. 290; xv, p. 63] strains producing sparse rhizomorphs became slightly diseased, while the poplar [ibid., vi, p. 586] and privet (*Ligustrum vulgare*) strains, especially the latter, forming a profusion of rhizomorphs, virulently attacked the tubers. There was, however, no sign of physiologic specialization within the fungus, the privet strain, for instance, being equally pathogenic to its own host, poplar, rose, and potato. Both on cherry agar and sterilized horse-chestnut wood the above-mentioned strains, as well as a number of additional isolations from Belgium, England, and France, displayed striking and apparently constant differences in cultural characters, including extent and colour of aerial mycelium, number of rhizomorphs, and capacity for fructification, the *P. sylvestris* strain, for instance, being the only one to form sporophores both in pure culture and in inoculation tests. In the case of potato tubers the rhizomorphs of the fungus may completely permeate the tissues. Trees take a considerable time (5 to 18 months in an experiment with oaks) to succumb to infection.

Tubeuf [C. v.]. **Tuberkulose, Krebs und Rindengrind der Eschen- (Fraxinus) Arten und die sie veranlassenden Bakterien, Nektriapilze und Borkenkäfer.** [Tuberculosis, canker, and cortical scab of Ash (*Fraxinus*) species and the responsible bacteria, *Nectria* spp., and bark beetles.]—*Z. PflKrankh.*, xlvi, 10, pp. 449–483, 31 figs., 1936.

The writer summarizes the work of previous investigators on the etiology of the so-called 'tuberculosis' of ash (*Fraxinus excelsior*), attributed by Nellie A. Brown to *Bacterium* [*Pseudomonas*] *savastanoi* var. *fraxini* [*R.A.M.*, xi, p. 683], and describes his own observations on the disease in Germany. He considers that the organism lives in cavities in the parenchyma and forms flat thickenings on the bark of the ash which develop into the 'bark roses' (flat, furrowed swellings). The *Nectria* (*ditissima* or *galligena*) [ibid., xiii, p. 732] cankers are characterized by smooth layers of suberized tissue which surround a wound penetrating to the wood. Frost cankers are similar but do not as a rule form annual layers of suberized tissue; they generally originate in the freezing of small shoots. Shallow cortical scab does not usually reach the cambium or wood, and the living bark tissues contain neither bacteria nor fungi. The short bark beetle (*Hylesinus fraxini*) is implicated in the disease, but the author considers that the beetles utilize the fissures made by the bacterium and fungus as channels of entry and thus establish a connexion between the rose or canker and scab syndrome.

Heavy damage from ash canker, sometimes involving extensive felling, is reported from the Kassel district, where trees up to five years old in both pure and mixed stands are liable to attack.

Tubeuf [C. v.]. **Die Ulmenkrankheit in München im Sommer 1936.** [The Elm disease in Munich in the summer of 1936.]—*Z. PflKrankh.* xlvi, 10, pp. 484–507, 22 figs., 1936.

The writer's observations on the entomological aspects of the elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in the Munich district of Germany [*R.A.M.*, xv, p. 479] are summarized, and the conclusion reached that the beetles chiefly involved in the transmission of infection are *Eccoptogaster* (*Scolytus*) *scolytus*, *E.* [*S.*] *multistriatus*, and *E.* [*S.*] *laevis*. No effective means of combating the fungus being known, it is suggested that an energetic campaign be adopted for the extermination of the insects.

Clinton (G. P.) & McCormick (Florence A.). **Dutch Elm disease—Graphium ulmi.**—*Bull. Conn. agric. Exp. Sta.* 389, pp. 701–752, 8 pl., 1936.

This exhaustive survey of the Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xvi, p. 142], made from a scientific rather than a practical standpoint, comprises a history of the disease in Europe, an account of its origin and spread in the United States [ibid., xv, p. 692 *et passim*], with special reference to Connecticut, and descriptions of the symptoms, the effect of the disease on the host, and the characters of the fungus. Information received from a number of European

scientists regarding the disease in their respective countries is appended together with a bibliography of 183 titles.

WORTHLEY (L. H.). **Progress in Dutch Elm disease eradication.**—*J. econ. Ent.*, xxix, 4, pp. 785–790, 1936.

Further details are given regarding the Dutch elm disease [*Ceratostomella ulmi*] situation in the United States [see preceding abstracts] as at 17th March, 1936. During the first four months of 1935, sanitation work was carried out in about one-third of the present infected zone, and during July, August, and September, about half the projected programme was completed. Over the entire area 80 per cent. as many diseased trees were found as in the two preceding years. At the end of the year 990,000 dead and dying trees had been removed and a further 465,000 labelled for future eradication.

OTTO (K. F.). **Zum Ahornsterben in der Baumschule.** [On the dying-off of Maples in the nursery.]—*Blumen- u. PflBau ver. Gartenwelt*, xl, 43, p. 516, 1936.

Acer platanoides and *A. pseudoplatanus* in German nurseries are stated to suffer severe damage from *Nectria cinnabarina* [*R.A.M.*, viii, p. 411], the fructifications of which, however, do not appear until the trees are dead. The early stages of the disease are characterized by wilting of the foliage and a discoloration of the wood, which is permeated by the hyphae of the fungus. Frequent inspections should be made and diseased trees eradicated and burnt.

YAMAMOTO (W.). **Woodrots of Taiwan (Formosa) I. Honeycomb heart rot of Persian Lilac.**—*J. Taihoku Soc. Agric. For.*, i, pp. 90–96, 1 pl., 5 figs., 1936. [Japanese.]

A fungus closely related to *Fomes senex* [*R.A.M.*, ii, pp. 142, 589] is stated to cause a honeycomb rot of the heartwood of Persian lilac (*Melia azedarach*) trees in Formosa. Cross sections through affected trunks show numerous white cavities, 2 to 5 by 2 to 7 mm., scattered along the annual ring of the heartwood. The fruiting bodies of the fungus are applanate, semicircular, sessile, often partially resupinate, sometimes imbricate, and measure 3 to 13 by 1·5 to 9 cm., the upper surface being brown or dark brown and sulcately zonate, and the under cinnamon to cinnamon-brown with diminutive pores. The context is corky, ochraceous-tawny, 1 to 3 mm. in thickness. The tubes are snuff-brown, often stratose, and measure 2 to 28 mm. in length. The cylindrical basidia, 16 to 20 by 3·6 to 4·3 μ, with 2 to 4 sterigmata, produce subglobose to elliptical, hyaline basidiospores, 3 to 5 by 3 to 3·5 μ. The conical, sharply pointed, straight or slightly curved, dark brown setae measure 19 to 34 by 5 to 8 μ, and the hyaline, obclavate cystidia are 15 to 20 μ in length. The fungus grows on modified Czapek's, onion, apricot, potato dextrose, and French bean [*Phaseolus vulgaris*] agars, forming a hyaline to ochraceous mycelium which gradually turns yellowish- or rusty-brown.

DEMAREE (J. B.) & COLE (J. R.). **A disporous Gnomonia on Pecan.**—*Phytopathology*, xxvi, 10, pp. 1025–1029, 2 figs., 1936.

Since 1928 a leaf blight of pecan (*Hicoria* [*Carya*] *pecan*) originally

reported by Matz (*Rep. Fla agric. Exp. Sta. 1917*, p. 89 R, 1918) as due to a *Gnomonia* has frequently been observed in southern Georgia. The circular or elongated spots produced by the fungus are light brown or tan to nearly black (the exact shade varying with the abundance of perithecial production, which takes place in mid or late July), and attain a diameter of up to $\frac{3}{4}$ in.

The scattered, submerged, subglobose to flattened, submembranaceous, dark brown to black perithecia are furnished with long, protruding, black necks and measure 80 to 150 by 100 to 160 μ. The asci are cylindrical, irregular, thin-walled, and contain commonly 2, occasionally 1, more rarely 3 or 4 uniseptate, fusiform to cylindrical, hyaline, guttulate spores, 24 to 51 by 5 to 10·5 μ. No conidial stage has been observed. Normal perithecia, asci, and spores developed on a mixture of maize meal and potato agar in about 20 days at the optimum temperature of 24° to 26·5° C. The fungus is named *G. dispora* n.sp. [with a description in English only].

VERRALL (A. F.). **The dissemination of Septoria acicola and the effect of grass fires on it in Pine needles.**—*Phytopathology*, xxvi, 10, pp. 1021–1024, 1936.

Evidence accumulated in Louisiana in 1932 indicates that the spores of *Septoria acicola*, the agent of a serious needle blight of longleaf pine [*Pinus palustris*] seedlings [*R.A.M.*, xiv, p. 266], are disseminated to a slight extent by wind, but that the spread of the fungus is mostly effected locally by means of spores conveyed in raindrops spattering from diseased plants. Two or more warm, rainy days appear to be necessary for profuse spore discharge, ordinary summer showers being too brief to induce the process and the temperature during the winter rains normally too low to permit it. Cultures from needles killed by fire in 1933 yielded no living material of *S. acicola*, the place of which in the burnt tips is rapidly taken by *Pestalozzia*, *Lophodermium*, and other fungi.

HOLST (E. C.). **Zygosaccharomyces pini, a new species of yeast associated with bark beetles in Pines.**—*J. agric. Res.*, liii, 7, pp. 513–518, 1 pl., 1 fig., 1936.

A Latin diagnosis and an English technical description are given of a yeast, which cultural investigations during three years have shown to be generally associated with the pine bark beetles *Dendroctonus brevicornis*, *D. frontalis*, *D. valens*, *Ips oregoni*, *I. emarginatus*, *I. avulsus*, *I. grandicollis*, and *I. calligraphus* in wood affected with blue stain (*Ceratostomella*) [spp.: *R.A.M.*, xv, p. 544] in the United States. The fact that the organism produces hat-shaped ascospores after a sexual process, together with its property of only fermenting glucose, fructose, and mannose of the common sugars, lead the author to consider it as a hitherto undescribed species of *Zygosaccharomyces*, for which the name *Z. pini* n.sp. is suggested.

TUBEUF [C. v.]. **Einfluss der Städte auf Pflanzenkrankheiten.** [The influence of towns on plant diseases.]—*Z. PflKrankh.*, xlvi, 10, pp. 507–509, 1936.

The author considers there are two main reasons for the rarity of

Ribes infection by white pine blister rust [*Cronartium ribicola*: *R.A.M.*, xvi, p. 136] in urban districts: (1) the virtual disappearance of pines and other conifers from towns owing to smoke injury; and (2) the premature development of the leaves in the relatively mild climate of cities, enabling them to escape the critical period for infection.

Colley (R. H.) & Amadon (C. H.). **Relation of penetration and decay in creosoted Southern Pine poles.**—*Bell Syst. tech. J.*, xv, 3, pp. 363–379, 2 figs., 7 graphs, 1936.

Poor penetration of the non-durable sapwood has been found to constitute the primary factor in the decay of creosoted southern pine [*Pinus palustris*] poles [*R.A.M.*, xvi, p. 77], over 3,000 of which, treated with coal-tar creosotes of various types at 13 plants in the southern States, were critically inspected to determine the time and location of the inception of decay. The poles had been in line for periods of 5 to 26 years under divergent climatic conditions in scattered localities east of the Mississippi. Of the failures, 95 per cent. were poles in which the creosote had penetrated less than 1·8 in. or 60 per cent. of the sapwood thickness, while no serious deterioration was observed among those penetrated to a depth exceeding 2·1 in. or 75 per cent. of the total thickness of the wood. The current Bell System treating specifications require a penetration of 2·5 in. or 85 per cent. of sapwood thickness, whereby the risk of failure by decay during the ordinary service life of a line is stated to be reduced to a practical minimum.

Young (H. E.). **The species of Diplodia affecting forest trees in Queensland.**—*Qd agric. J.*, xlvi, 3, pp. 310–327, 7 figs., 1 graph, 1936.

The planting of exotic species of *Pinus* in Queensland has been accompanied by the development of die-back caused by two distinct species of *Diplodia*. The first, originally recorded at Benarkin in August, 1930, on *P. radiata* and since at Imbil on the same host, has been found to be due to *D. pinea* [see above, p. 148]. The second disease was first found at Burwash in 1934 and so far has been confined to this locality. It is attributed to *D. natalensis* [*R.A.M.*, xiv, p. 729], which is common in the infected area on lemon trees. Inoculations of seedlings of *P. insularis*, *P. patula*, *P. taeda*, and *P. caribaea* in the greenhouse with pure cultures of *D. pinea* isolated from *P. radiata* gave rise to typical die-back, followed by death, as did similar inoculations of *P. taeda* and *P. caribaea* seedlings with *D. natalensis* isolated from *P. taeda*. Isolations of the latter species from lemon were also pathogenic to *P. taeda* and that from *P. taeda* to lemon fruits. Inoculations with both *D. pinea* and *D. natalensis* generally had less severe effects when the plants were placed in the open than when kept in humid greenhouse conditions.

The die-back caused by *D. pinea* appears in summer as a bronzing and finally a browning of the needles, usually of a leader or a terminal shoot of a lateral branch. The shoot wilts and dies, and the infection may spread down the tree and kill it. Infection often follows hail injury. In severe attacks there is a copious exudation of resin from cracks in the bark of the trunk, which is often greyish-white. The first symptoms of the condition caused by *D. natalensis* appears in early spring during warm, humid weather, the foliage in the affected parts

becoming bronzy-green, and dark, water-soaked areas being present on the needles. The old foliage suffers first. Not more than six weeks elapse between the appearance of the disease and the death of the tree. In the great majority of the cases infection begins on the side of the trees sheltered from the sun and the prevailing winds. *P. caribaea* showed indications of resistance.

Other species attacked in Queensland by *D. pinea* besides *P. radiata*, though to a less extent, are *P. pinaster*, *P. patula*, *P. taeda*, and *Cupressus sempervirens*, and the fungus has been isolated also from *P. radiata*, *P. longifolia*, *P. caribaea*, *P. coulteri*, and *P. pinaster* from New South Wales. The steps taken against *D. pinea* consisted in the removal of all diseased trees, and the discontinuation of planting *P. radiata* and *P. pinaster*. Against *D. natalensis* the control measures comprised pruning back all dead and dying wood on living trees and burning all the prunings. All trees that were unlikely to be saved in this way were removed and burnt. A careful watch was kept for fresh cases of die-back and these were treated as described. The prompt measures adopted against *D. natalensis* appear to have succeeded in clearing up the trouble.

The only other *Diplodia*-like fungus recorded as a coniferous parasite in Queensland is *Botryodiplodia theobromae* found on hoop pine (*Araucaria cunninghamii*) seed which had failed to germinate and on seedlings apparently killed by the fungus.

Miller (J. A.) & Aldrich (K. F.). **Pseudolarix amabilis, a new host for Dasyscypha willkommii.**—*Science*, N.S., lxxxiii, 2160, p. 499, 1936.

A search for the European larch (*Larix europaea*) canker fungus, *Dasyscypha willkommii* [see next abstract], throughout a 2½-mile radius from each of the two known centres of infection at Hamilton and Ipswich, Massachusetts, revealed the presence of closely similar symptoms on *Pseudolarix amabilis*, cultures from the inner bark of which were identified by G. G. Hahn as *D. willkommii*. This is stated to be the first record of the occurrence of European larch canker in the United States on a genus other than *Larix*.

Hahn (G. G.) & Ayres (T. T.). **The European Larch canker and its relation to certain other cankers of conifers in the United States.** —*J. For.*, xxxiv, 10, pp. 898–908, 4 figs., 1936.

Larch canker (*Dasyscypha willkommii*) [*R.A.M.*, xiii, p. 482; xv, p. 618], discovered in the United States in 1927 on *Larix europaea* imported from Great Britain, is confined to a small area in the vicinity of Hamilton and Ipswich, Massachusetts. The fungus infects only species of *Larix* and *Pseudolarix*, and contrary to European and American reports, does not attack the blue form [var. *glauca*] of Douglas fir (*Pseudotsuga taxifolia*) nor has it been observed on pine, fir, or spruce growing in the larch canker-infested area at Hamilton. Inoculation experiments were successful on *L. europaea*, *L. leptolepis*, *L. laricina*, *L. occidentalis*, and *L. dahurica*. A description is given of cankers related to the European larch disease found on the blue form of Douglas fir and *Pinus ponderosa* and associated with *D. ellisiana* [ibid., xiii,

p. 553], which is distributed generally as a saprophyte on conifers along the eastern seaboard of the United States. White pine canker of native five-needled pines closely resembles European larch canker, but is caused by *D. pini* [ibid., xiv, p. 266].

General spread of the European larch canker appears to have been checked by the prompt destruction of over 3,700 infected trees made in an attempt at complete eradication of the disease, but in 1935 new infections were found on European larch (55 trees) and one individual of *Pseudolarix amabilis* [see preceding abstract]. Steps have been taken to secure the destruction of these trees.

Refshauge (Lyly D.) & Proctor (Eunice M.). **The diagnosis of some wood-destroying Australian Basidiomycetes by their cultural characters.**—*Proc. roy. Soc. Vict.*, N.S., xlviii, 2, pp. 105–123, 3 pl., 1936.

With a view to facilitating the laboratory identification of certain Australian wood-destroying fungi, the authors carefully determined and here tabulate and describe the cultural and microscopic features of 14 such organisms on four different media, viz., malt agar, potato dextrose agar, Czapek's synthetic agar (modified), and Czapek's synthetic agar plus malachite green. The fungi thus investigated were *Stereum illudens*, *S. lobatum*, *S. vellereum*, *Fomes clelandi*, *F. hemitephrus*, *F. robustus* [*R.A.M.*, xiii, p. 664], *Ganoderma applanatum*, *Polyporus anthracophilus*, *P. arcularius*, *P. gilvus* [ibid., xv, p. 410], *P. rhipidium*, *Polystictus versicolor* [ibid., xvi, p. 139], *Trametes lilacino-gilva* [ibid., viii, p. 80], and *T. ochroleuca*. Certain fungi, e.g., *Polyporus arcularius*, produced fruiting bodies in culture much more readily than others. Evidence is briefly adduced to show that the decolorization of Czapek's synthetic agar plus malachite green by many of the organisms is a function of the living form and not the result of metabolic secretions. Four keys are compiled from the results obtained, three based on cultural characters, and one on microscopic features.

Bondartzeff (A. S.). К вопросу о нахождении и распространении **Polyporus destructor (Schrad.) Fr.** в **СССР.** [On the occurrence and distribution of *Polyporus destructor* (Schrad.) Fr. in the U.S.S.R.]—*Acta Inst. bot. Acad. Sci. U.R.S.S.*, Ser. II (*Pl. Cryptogamae*), *1936*, 3, pp. 669–678, 4 figs., 1936. [German summary.]

In a cursory review of the relevant literature the author points out the diversity of conception among mycologists concerning the fungus known as *Polyporus destructor* [*R.A.M.*, xiii, pp. 137, 604], the first reliable diagnosis of which was given by Bourdot and Galzin (Hymenomycètes de France, pp. 546–547, 1927). The pileus is sessile, frequently narrowing at the base almost to a stipe, but not infrequently spreading with detached margins, and measures 0·5 to 1·5 cm. long, 1 to 3·5 cm. broad, and 0·3 to 0·6 cm. thick. The surface is white, slightly tomentose towards the margins, later becoming dirty white or faintly reddish-brown in places, especially towards the base, and the margins are slightly involuted, thin, and covered with a slight down. The tubes are short, but may attain up to 5 mm. in old pilei, forming a layer much thicker than the flesh; they are white at first, becoming creamy-brown; the

pores are rounded to irregular, and 3 to 4 per mm. The basidia are 12 to 15 by 5 to 6 μ in diameter, clavate, with 2 or 4 sterigmata. The spores are numerous, ellipsoidal, slightly bent, hyaline, and 4 to 5·5 (6) by 2·5 to 3 μ.

Notwithstanding prolonged searches in Leningrad, the author could find only two typical specimens of *P. destructor*, one in a hothouse and one in a cellar, and a further specimen was sent him from Kostroma, also from a cellar. He considers, in agreement with Lloyd, that the fungus is very rare in nature, and is strictly confined to processed timber. The numerous records of it which exist from Russia, as well as practically all the herbarium specimens in that country, are described as erroneous identifications.

A description is also given of *P. destructor* var. *resupinatus* Bourdot & Galzin, which Pilát (*Bull. Soc. Myc. Fr.*, xlviii, 1, p. 9, 1932) has separated as a distinct species, *Leptoporus resupinatus* (B. & G.). This fungus occurs on rotting coniferous wood in the forests, and has only been recorded three times in European Russia.

WHITEHEAD (T.). **Experiments on the use of lime in controlling finger and toe disease of Brassicae.**—*Welsh, J. Agric.*, xii, pp. 183–192, 1936.

In experiments on the control of club root of *Brassica* spp. [*Plasmodiophora brassicae*: *R.A.M.*, xv, p. 547] extending from 1933 to 1935 applications of lime were made on heavily contaminated soils at Pwllheli and Bangor, the former soil being a coarse sand of P_H 5·25, and the latter a clay of P_H 7·24.

It was found that the more alkaline soils averaged less disease than the acid ones, but at Bangor on soil of P_H 7·81 containing 0·41 per cent. exchangeable calcium oxide, 37 per cent. of the cabbages became badly infected. Cauliflowers growing in plots of P_H 7·85 showed 71·4 per cent. infection, as compared with 85·3 per cent. in plots at P_H 5·68. At Pwllheli heavy percentages of badly diseased plants, ranging from 100 per cent. in the case of cauliflowers to 90 and 60 per cent. for Brussels sprouts and cabbages, respectively, occurred in plots where the P_H values at planting and the end of the season were 7·45 and 7·77, respectively. It is, therefore, evident that a high P_H value of the soil does not in itself prevent infection. Increasing control was given, however, wherever control resulted, by increasing amounts of lime. The lime is considered to exert a directly lethal effect on the spores, and any residual effect of small dressings is due to cultivation assisting in the incorporation of the lime in the soil.

In experimental plots, cauliflowers were the most susceptible, followed by spring-sown cabbage, Savoy cabbage, and Brussels sprouts, whilst swedes, which are heavily infected under farm conditions, were lightly attacked. The author considers that this result may point to the existence of different physiologic strains of the fungus.

JAMALAINEN (E. A.). **Tutkimuksia möhöjuuresta (Plasmodiophora brassicae Wor.).** [Investigations on club root (*Plasmodiophora brassicae* Wor.).]—*Valt. Maatalousk. Julk.*, 85, 36 pp., 1 map, 1936. [German summary.]

Club root of crucifers (*Plasmodiophora brassicae*) is stated to occur

in a destructive form in Finland [*R.A.M.*, v, p. 190], more especially in the south, in densely populated regions, and in the vicinity of towns, white cabbage being attacked with particular severity.

Of the 88 wild or ornamental crucifers used in inoculation experiments with the fungus [cf. ibid., xiii, p. 2], 69 were susceptible, 29 of which do not appear to have been previously recorded as liable to club root, including *Alyssum campestre*, *Arabis bellidifolia*, *Biscutella laevigata*, *Braya alpina*, *Draba grandiflora*, *Erysimum rupestre*, *Hesperis tristis*, *Iberis odorata*, *Rapistrum perenne*, *Sisymbrium cumingianum*, and *Thlaspi violascens*. All the varieties of white, red, and Savoy cabbage grown in infested soil contracted 100 per cent. infection, and most kinds of cauliflower and kohlrabi sustained equally severe damage. A fair degree of resistance was shown by Hercules Brussels sprouts (30 per cent. infection), while most curly and fodder cabbage varieties included in the trials proved well able to withstand the attacks of the pathogen. On the other hand, turnips and swedes suffered extensive injury, even the most resistant of the former (Forssa) showing 85 per cent. infection and of the latter (Yellow Tankard) 83·3. Radishes were in general little affected by the disease, to which a particularly high degree of resistance was shown by Long Black Paris Winter, Delikatess, Dreienbrunnen, Rubin, and Saxa.

In experimental plots of 2 sq. m. each the best control of club root on Bangholm turnips and a Finnish swede variety was obtained by the sterilization of the soil, a fortnight prior to sowing, with 400 c.c. of 40 per cent. formalin per sq. m. [ibid., xii, p. 710], while fairly satisfactory results were also given by 0·1 per cent. mercuric chloride [ibid., xi, pp. 17, 686] and 0·25 per cent. uspulun [ibid., xii, pp. 233, 493], but not by slaked lime (2 kg. per sq. m.). The treatment of seedlings with various disinfectants at and after planting was ineffectual.

Kalashnikoff (K. J.). Влияние минеральных удобрений на задержку развития черной ножки Капусты в защищенном грунту. [Influence of mineral fertilizers on the development of black leg of Cabbage under glass.]—*Pl. Prot. Leningr.*, *1936*, 9, pp. 49–53, 1936. [English summary.]

The results of greenhouse experiments in Leningrad showed that seed-bed infection of cabbage seedlings with blackleg (*Moniliopsis aderholdi*) [*R.A.M.*, xv, p. 625] was reduced by from 22·4 to 28·5 per cent. as compared with controls, in beds that had received applications of either Chile saltpetre at the rate of 33 gm. per sq. m., ammonium sulphate (28 gm.), sylvinite (66 gm.), or superphosphate (44 gm.). The general health of the cabbage seedlings was also considerably improved by the fertilizers.

McCubbin (W. A.). **Analysis of typical plant diseases from the quarantine standpoint.**—*Phytopathology*, xxvi, 10, pp. 991–1006, 1936.

An analysis [presented in tabular form] of 200 typical plant diseases from the quarantine standpoint [*R.A.M.*, xv, p. 688] indicates the type of quarantine action (embargo, detention, disinfection, inspection, and unrestricted entry) necessary in the case of seeds, other propagating material, and commercial produce of the chief host for the exclusion of

such diseases. The summarized results denote that embargo is scarcely needed for seeds and would be of minor use for other propagating material, but should be widely employed for commercial produce. Comparatively few seeds require detention, which should be freely used, however, for other propagating materials. Disinfection, the important procedure for seeds, is of only moderate use for other propagating materials and commercial produce, while inspection is of little value for all categories from the standpoint of exclusion. Unrestricted entry is permissible for many seeds but for very little other propagating material and for only a limited range of commercial produce. The last-named would appear to constitute the limiting factor in the attainment of an ideal exclusion system.

Memorandum on the Provisions of the Pharmacy and Poisons Act, 1933, affecting the purchase of Poisons for use in Agriculture and Horticulture.—*Home Office Memor. Poisons No. 4 (Agric. & Hort.)*, 11 pp., 1936.

This memorandum presents in summary form information as to the channels through which and the means by which persons engaged (*a*) as amateurs or (*b*) as professionals in agriculture and horticulture in Great Britain may lawfully obtain the poisons they require for their pursuit or business.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, July–September, 1936.—pp. 115–126, 1936.

Summaries are given of the plant quarantine import restrictions in force in Malta, Denmark, Irish Free State, Free City of Danzig, Mexico, and Switzerland, together with an explanatory note on the ten Federal domestic plant quarantines controlling the inter-State movement of plants and plant products within the United States.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, viii, 7, pp. 160–161, 177–178, 1936.

Prussia. Province of Schleswig-Holstein, administrative district of Schleswig. An Order dated 22nd June and valid from 5th July, 1936, to 31st March, 1946, provides for the regular inspection of Douglas firs (*Pseudotsuga douglasii*) [*P. taxifolia*] in nurseries and other horticultural establishments by the local plant protection authorities with a view to preventing the spread of diseases [especially *Rhabdocline pseudotsugae*: *R.A.M.*, xv, p. 832, and above, p. 147]. Under the regulations the movement of Douglas firs from nurseries is restricted and any trees officially designated as infected must be destroyed within 14 days.

Holland. Under the terms of an Order dated 13th December, 1935, all potato consignments from Great Britain, Germany, and Poland intended for import into, or transport through, Holland must be accompanied by duly authenticated certificates vouching for the freedom of the material from infection by *Synchytrium endobioticum* [ibid., x, p. 293; xv, p. 127] and for the absence of the fungus from the place of cultivation and a surrounding radius of 500 m.